CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada.

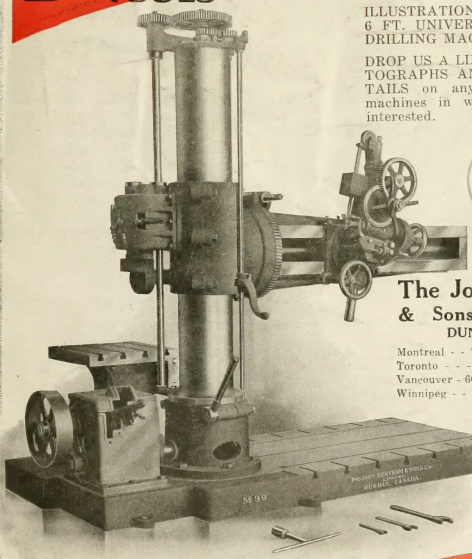
Vol. XXI. No. 17. Publication Office: Toronto, April 24, 1919 Subscription Price $3.00 per Year

BERTRAM MACHINE TOOLS

are built for safety and service, and are backed by a concern with sixty years' experience and the largest of its kind in Canada.

ILLUSTRATION SHOWS OUR 6 FT. UNIVERSAL RADIAL DRILLING MACHINE.

DROP US A LINE FOR PHOTOGRAPHS AND FULL DETAILS on any machine or machines in which you are interested.



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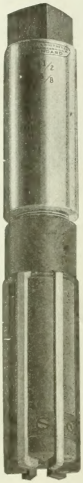
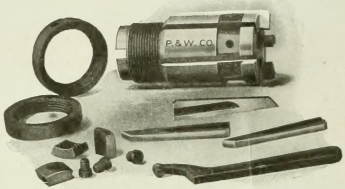
SMALL TOOLS

P. & W. Adjustable
BLADE REAMERS





These reamers have eccentric relief and can be set to size without regrinding. They are unexcelled for design and simplicity and ease of adjustment. The eccentrically relieved blades are stronger than others, do not chatter, and produce a smoother hole. The hand, shell and fluted chucking reamers have interchangeable nuts, screws and wrenches. The bottom of a hole can readily be faced. By a simple adjustment of the blades the reamers can easily be set to size without regrinding.

PROMPT SERVICE

Small Tools are carried in stock. Place your order there to-day.

Precision Machine Tools--Standard and Gauges

PRATT & WHITNEY CO.
OF CANADA, LIMITED

Works: DUNDAS, ONTARIO

MONTREAL	TORONTO	WINNIPEG	VANCOUVER
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BERTRAM MACHINE TOOLS

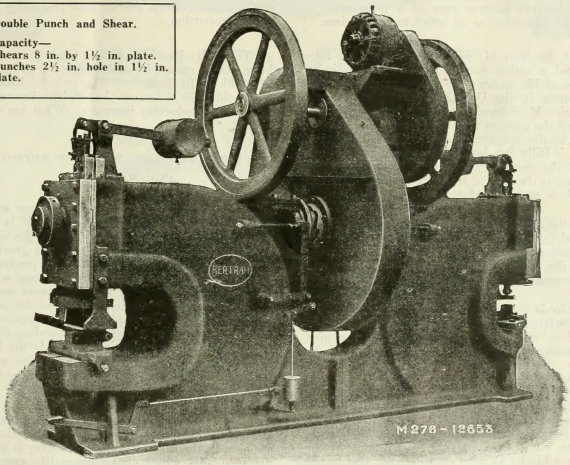
For Structural, Bridge and Shipbuilding Plants

Modern in design and built for heavy service, our line embraces a varied equipment of Punches, Shears, Bending and Straightening Rolls, Coping Machines, Rotary and Plate Planers.

The assistance and advice of our engineers are yours for the asking.

Double Punch and Shear.

Capacity—
Shears 8 in. by 1½ in. plate.
Punches 2½ in. hole in 1½ in. plate.



The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO, CANADA

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The Publisher's Page

TORONTO APRIL 24, 1919

Urges Advertising to Combat Bolshevism

Arthur Dunn Points to the Weapon of Misdirected Education Which Has Become a Menace in the Hands of Lenine and Trotzky—The Truth Will Prevail, if It Is Made Known.

IN a speech at the New York Advertising Club, on April 3, Arthur Dunn, business counsellor and former vice-president of the United Cereal Mills, issued a call to advertising men to become part of a movement to spread education as an offset to Bolshevism.

At the start of his speech, Mr. Dunn conducted a voting contest to discover the judgment of his audience as to the most successful salesman in the United States. Henry Ford, Charles M. Schwab and President Wilson received the greatest number of votes, but according to the speaker no one picked his choice, who is Billy Sunday. The speaker pointed out that the greatest sales problem in the world to-day is the sale of true education to both the workers and manufacturers.

After pointing out some of the inequalities which are at present conducive to the spread of radicalism, Mr. Dunn said that the remedy for the present situation is immediate and widespread education through advertising.

"Goods are of no value unless exchanged," he declared; "the producers of the world must produce enough for themselves and the men in non-producing lines. Bolshevism would destroy the civilization built on the Ten Commandments, would produce by vicious and ignorant energy instead of intelligent directed energy. The competing salesmen, Lenine and Trotzky, are brainy men. They do not despise the working man, thinking his education of no value, but teach him political economy of the wrong kind. It is in shutting our eyes to the educational work being carried on by our competitors that the present danger to civilization lies.

"A certain element in labor when dissatisfied with present conditions, has tried to find remedies through the strike, sabotage, shorter working hours. All these methods are wrong in that they tend to cut down production without which prosperity is impossible. Cutting down production works around in a vicious circle, cutting down welfare and prosperity in direct proportion.

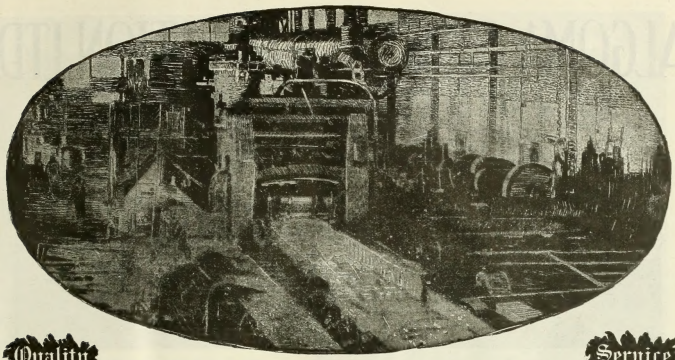
"Through advertising we can teach the workingman that prosperity and production go hand in hand. The leaders of the cult in Russia have told their followers that Bolshevism will fail unless production increases. What are we doing?

EDUCATION NECESSARY BOTH FOR EMPLOYER AND EMPLOYEE

"The workingman is not the only one who needs education; the employer needs it as badly, if not more. We must teach the employer of men that labor must have a greater share in the prosperity it helps to produce. We must show the employer that the man who works for him is entitled to a minimum wage which shall give him enough to live on and something over. We must make the employer see that a new economic system is coming, that co-operation, not competition, will rule the industrial life of the future. Competition was the habit and invention of the savage — co-operation is modern and more efficient.

"When you return to-night to your home and all that it means to you, realize that there are men in the world who would destroy it and the principles which make home life sacred, realize that these men are using modern sales methods to secure followers for their creed, then go out and get busy, urge all men in the publishing and advertising business to give their thought and their effort to offsetting the spread of these ideas by education and advertising."—PRINTERS' INK.

Canadian Machinery and Manufacturing News, April 24th, 1919. Vol. 21, No. 17. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00; in United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office at Buffalo, under the Act of March 3rd, 1879.



Quality

Service

REASON IT OUT

Demand full value for every dollar by spending it where you earn it

PURCHASE THE PRODUCTS OF CANADIAN MILLS

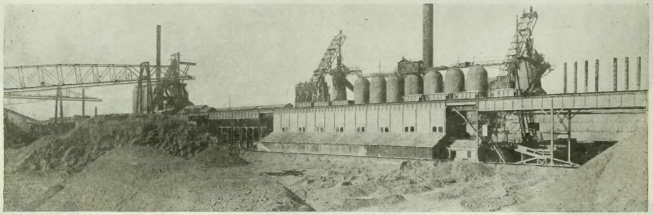
A Canadian Dollar is Worth One Hundred Cents in Canada

THE STEEL COMPANY OF CANADA LIMITED

HAMILTON MONTREAL

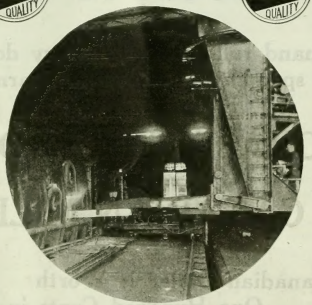
ALGOMA STEEL CORPORATION, LTD.

SAULT STE. MARIE, ONTARIO



BLOOMS,
BILLETS,
SLABS,
STRUCTURAL
STEEL
MERCHANT
BARS
CONCRETE
REINFORCING
BARS
IRON, BRASS
AND BRONZE
CASTINGS

MARK OF ALGOMA OH QUALITY



Charging and Withdrawing Crane

Sulphuric Acid. *Nitre Cake*

MARK OF ALGOMA OH QUALITY

STEEL
RAILS
Open Hearth Quality
(All Sections from 12 lbs
to 100 lbs per yard)
SPLICE
BARS
STEEL
TIE PLATES
PIG IRON
BASIC, FOUNDRY-
BESSEMER
SULPHATE OF
AMMONIA

GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT

BETTS

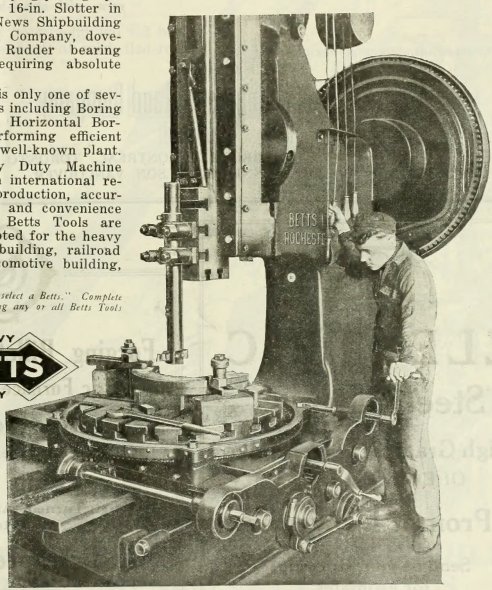
Betts 16-in. Slotter in Operation in Newport News Shipbuilding and Dry Dock Co.

The accompanying photograph shows a Betts 16-in. Slotter in the Newport News Shipbuilding and Dry Dock Company, dovetailing brass Rudder bearing ring halves requiring absolute accuracy.

This Slotter is only one of several Betts Tools including Boring Mills, Planers, Horizontal Boring Mills, performing efficient service in this well-known plant.

Betts Heavy Duty Machine Tools enjoy an international reputation for production, accuracy, durability and convenience of operation. Betts Tools are especially adapted for the heavy duties of shipbuilding, railroad repair and locomotive building, steel mills, etc.

"To avoid regret: select a Betts." Complete information concerning any or all Betts Tools promptly furnished.

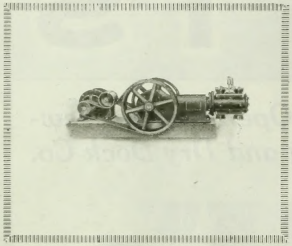


HEAVY BETTS DUTY

Planers
Boring and Turning Mills
Tire Turning Mills
Car Wheel Borers
Slotters
Horizontal Boring, Drilling and Milling Machines

BETTS MACHINE CO.
408 Blossom Rd. Rochester, N.Y.
Formerly of WILMINGTON, DEL.

The Short Belt Drive For Compressors Saves Space



Have you been wondering how you can fit that compressor into your power house? Here is the solution—the short-belt drive.

We build both single-stage and two-stage machines—straight-line and duplex with this type of drive.

Less floor space
Less belt expense
No belt stretching
Capacities up to 2,000 ft. per min. with short-belt drive.

Send for our booklet on how to apply the short-belt drive to the best advantage.

Canadian Ingersoll-Rand Company
Limited

SYDNEY, SHERBROOKE, MONTREAL, TORONTO
COBALT, WINNIPEG, NELSON, VANCOUVER

E&M

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Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED
WELLAND ONTARIO

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Forging Billets and Bars
Electric Furnace, Alloy Steels

Die Blocks
Annealed—Heat Treated

Piston Rods
Rough Turned—Annealed—Heat Treated

High Speed Steel

General Steel Company
Milwaukee, Wisconsin
DETROIT – 823 Dime Bank Building

SPEED · ACCURACY

Chemistry the Keynote of Tool Efficiency

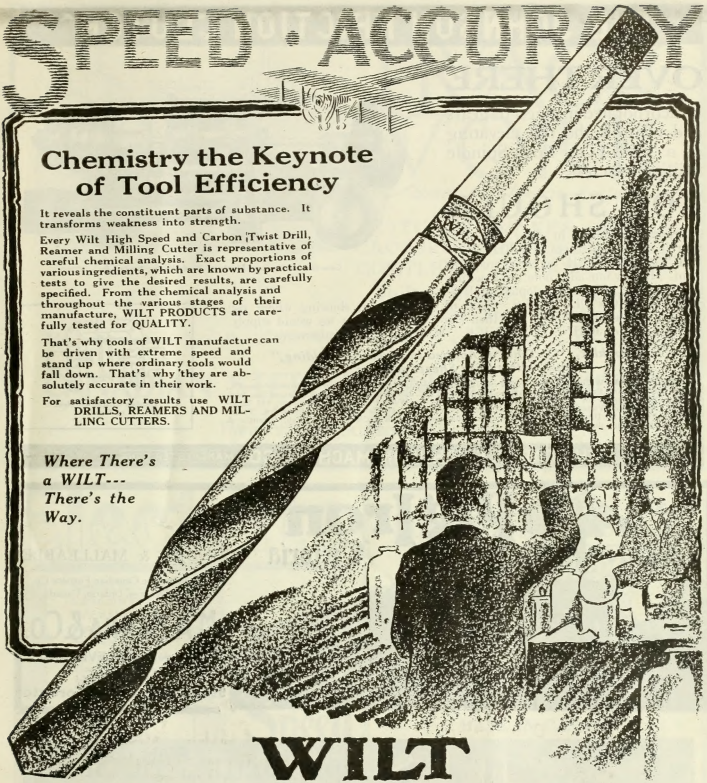
It reveals the constituent parts of substance. It transforms weakness into strength.

Every Wilt High Speed and Carbon Twist Drill, Reamer and Milling Cutter is representative of careful chemical analysis. Exact proportions of various ingredients, which are known by practical tests to give the desired results, are carefully specified. From the chemical analysis and throughout the various stages of their manufacture, WILT PRODUCTS are carefully tested for QUALITY.

That's why tools of WILT manufacture can be driven with extreme speed and stand up where ordinary tools would fall down. That's why they are absolutely accurate in their work.

For satisfactory results use WILT DRILLS, REAMERS AND MILLING CUTTERS.

Where There's a WILT--- There's the Way.



WILT

HIGH SPEED AND CARBON TWIST DRILLS, REAMERS AND MILLING CUTTERS

Manufactured by the

WILT TWIST DRILL CO.

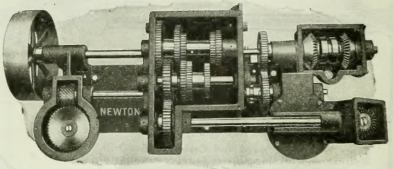
Walkerville OF CANADA LIMITED **Ontario**

London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, LONDON, E.C. 2 Eng.

THE JOHNSON FRICTION CLUTCH

OVER THERE

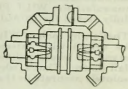
is incorporated in a nest of gears and controls the rail elevating on a NEWTON Four Spindle Milling Machine.



Courtesy of Newton Machine Tool Works, Phila., Pa.

YOU SHOULD

incorporate clutches in your machine. Bear in mind that there is a JOHNSON FRICTION CLUTCH for every requirement. Follow our ads., note the machine tool builders who have adopted JOHNSON FRICTION CLUTCHES. Send us a blue print showing where you desire to use a clutch. We will then show you just what we would supply. This is a part of JOHNSON SERVICE. What are your requirements?



Double Clutch in Nest of Gears

Our booklet, "Clutches as Applied in Machine Building," and Yellow Data Sheets are free

AGENTS: CANADA—Williams & Wilson, 320 St. James St., Montreal; The Canadian Fairbanks-Morse Co., Limited, Montreal and Branches. ENGLAND—The Efandem Co., Limited, 22 Newman St., Oxford St., London, W. 1. Sole Agents for British Isles. AUSTRALIA—Edwin Wood Pty., Hdwe. Chambers, 231 Elizabeth St., Melbourne, Victoria. JAPAN—Andrews & George Co., 16 Takezawacho, Kiobashiku, Tokyo. SOUTH AFRICA—D. Drury & Co., Main Street, Johannesburg. FRANCE—Anciens Etab. Glaenzer & Perreaud, 18 Fauborg du Temple, Paris.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada

M.A. HANNA & CO.

Sales Agents, CLEVELAND

Canadian Office:
904 C.P.R. Bldg., Toronto

FIRTH'S Speedicut HIGH SPEED Steel

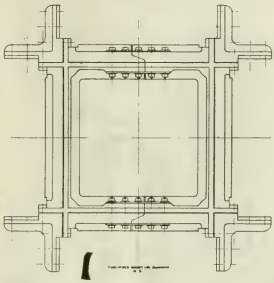
Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES | 449 St. Paul St. West, MONTREAL
79 West Adelaide St., TORONTO

J. A. SHERWOOD
Canadian Manager



TRACK WORK

for Steam & Electric Railways

SWITCHES · MATES · FROGS
CROSSES · DIAMONDS · ETC.
COMPLETE INTERSECTIONS

Built-up, Hard-Centre or Solid Manganese-Steel Construction

Manufacturers of Balkwill Articulated Cast Manganese Crossings.

CANADIAN STEEL FOUNDRIES, LIMITED

Transportation Building, Montreal

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the **introduction of Uranium** — make this a steel of truly remarkable cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.
LATROBE, PA.

High Speed Steel

Uranium

LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON
TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH
OF CANADA, LIMITED

Head Office:
298-300 St. James Street, Montreal.

Works:
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Branches:

126 Wellington St. W. TORONTO
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McArthur Building WINNIPEG

FORD-SMITH MILLERS

The Last Word in Accuracy and Production

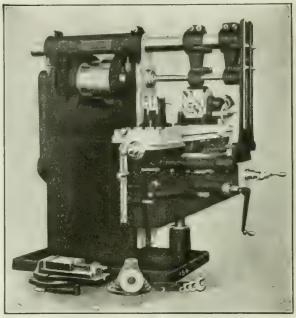
In the keen competition about to begin both for home and export business, only the efficiently equipped and economically run shops will succeed. The use of Ford-Smith Millers for accurate, general work, and quantity manufacturing will help you to the desired results.

Get in touch with us. Our service is at your disposal.

The Ford-Smith Machine Co.
LIMITED

Hamilton, Ontario, Canada

FOREIGN AGENTS: W. E. Storey, 3 Arundel St., London, Eng. Alf. Herbert, Limited, 54 Dey St., New York, U.S.A.



Plain and Universal Milling Machines

IMPERIAL GENUINE BABBITT METAL

The Highest Grade Manufactured

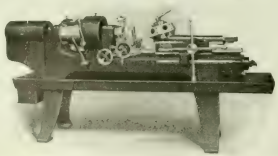
Made specially for all HIGH SPEED, HEAVY ENGINES and EXTRAORDINARY HARD WORK

Manufactured and guaranteed to give excellent service by

THE CANADA METAL COMPANY, Limited, FRASER AVENUE TORONTO, Hamilton, Montreal, Winnipeg, Vancouver

THE TILTED TURRET

A CLEAR TRACK FOR THE STOCK



INVESTIGATE!

SEND FOR
CATALOG "C"
OR
ASK THE USER

WOOD TURRET MACHINE CO.
BRAZIL, INDIANA, U.S.A.

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Western Sales Offices:
Room 14 Windsor Hotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

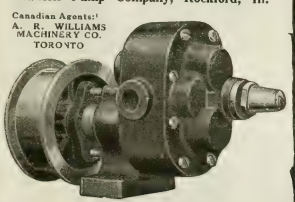
TRAHERN

ROTARY GEARED PUMPS

Use the Individual Pump Different classes of work require different compounds. By using the individual system, as many different compounds as desired may be used. This is a valuable feature. Trahern Rotary Geared Pumps. Would you like to try one? Write.

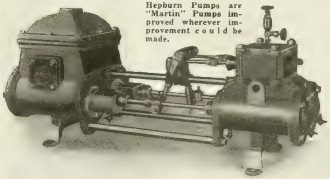
Trahern Pump Company, Rockford, Ill.

Canadian Agents:
A. R. WILLIAMS MACHINERY CO.
TORONTO



Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED
18-60 Van Horne Street Toronto, Ontario

WAR is destructive. Peace is constructive. War has taught us many things, chief of which is the great value of Time. Time is the essence of your life and mine. Whatever saves Time, saves Life.

"Red Cut Superior"

The Nationally Known FIRST QUALITY

HIGH SPEED STEEL

Is the avowed Enemy of Waste and Inefficiency, and allied with Life. Save Time, Save Life

Are your Tools made of "Red Cut"?

VANADIUM-ALLOYS STEEL CO.

General Sales Offices, PITTSBURGH, PA.
Works, LATROBE, PA.

BOSTON
BUFFALO
CINCINNATI
CHICAGO
CLEVELAND
DETROIT
PITTSBURGH
MONTREAL
NEW YORK
TORONTO

Swedish Steel & Importing Co., Limited

Montreal
New York
Toronto
Denver

Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK
SS
DOUBLE "ESS"

PROMPT SHIPMENTS from large stock

WOLFRAM
MADE IN THE U.S.A.
HIGH SPEED STEEL
TRADE MARK

A Keen Cutter

WOLFRAM *Is Both*

VULCAN CRUCIBLE STEEL CO.
Aliquippa Pa. U.S.A.
Represented in Canada by Pitcairn Norton
Collard & Company
MONTREAL Que.

Strong in the Neck

CANADA
FOUNDRIES & FORGINGS
LIMITED

A SOLEMN WARNING

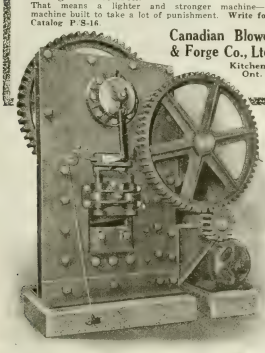
A flood of business will overwhelm this country inside of two months. Problems of supply must be met and faced squarely. Those firms who have courage are getting their supplies now. Those who are hesitating are going to receive an awful jolt when they finally decide to proceed with business, because it will be impossible to get service. They will then blame everybody but themselves. Our solemn warning is, "Don't blame us because you didn't see this vision."

Canada Foundries & Forgings, Limited
WELLAND, ONT.

CANADIAN ARMOR PLATE

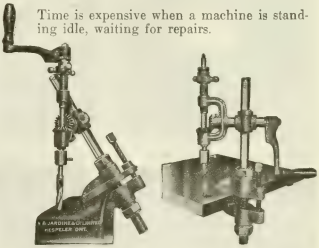
PUNCHES, SLITTING SHEARS, and BAR CUTTERS are dependable. They are built of "Armor Plate" steel—tensile strength 75000 lbs. per square inch—7½ times as strong as cast iron.
That means a lighter and stronger machine—a machine built to take a lot of punishment. **Write for Catalog P S-16**

Canadian Blower & Forge Co., Ltd.
Kitchener Ont.



Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



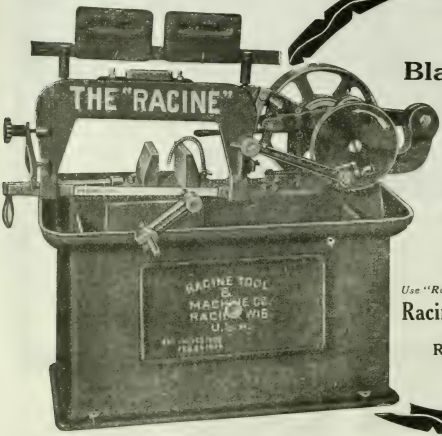
On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

"THE RACINE"

High Speed Metal Cutting Machine



Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, the "RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways the "RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H. S. Tungsten Power Blades

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Melbourne Avenue
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HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
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HEAVY MACHINE SAW BLADE
ENOX 18 G. 17G & 16 TEETH 15 G THICK TO INCH
N. TPI WIRE ACCORDING TO TYPE & SPEED OF MACHINE

ENOX
Hacksaw Blades
ARE THE BEST

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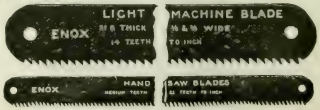

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For two generations we have been making fine precision instruments—building them to the Starrett standard—not to a price.

To-day the name Starrett is recognized the world over as standard for accuracy. Starrett Tools are helping skilled mechanics produce high-quality work.

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The L. S. Starrett Company

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

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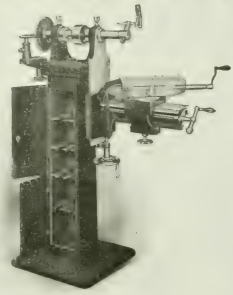
OBTAIN THE BEST RESULTS

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS



GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

Simple **Light Running** **Accurate**

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriege is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

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THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

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Marshalltown, Iowa
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"Not Steel but its Master"

It is in a class by itself. In your shop it will operate with the greatest degree of economy and efficiency.

STELLITE loses no time and is unsurpassed for uniformity and high average results.

Let us demonstrate to you at our expense just what STELLITE will do for you in the way of increased production and better work.

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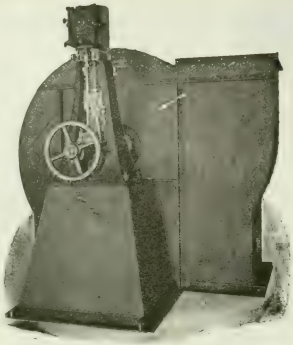

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"Keith" Fans will be found more economical and have a greater efficiency where conditions are unusually severe, because they possess advantages over other Fans used for the same purpose.

The "Keith" Fan is the one that will give you continued and unqualified satisfaction.

Our New Catalogue No. 55 has just come from the Press. Tell us where to address it and you will receive one by first mail.

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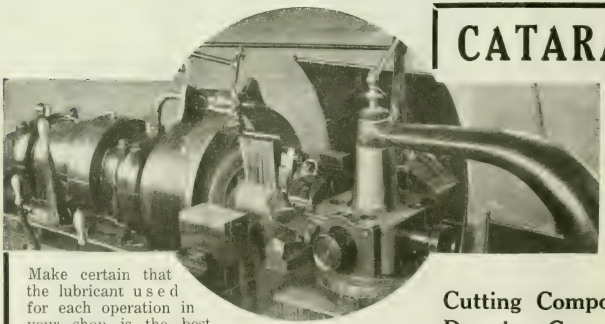

ACME
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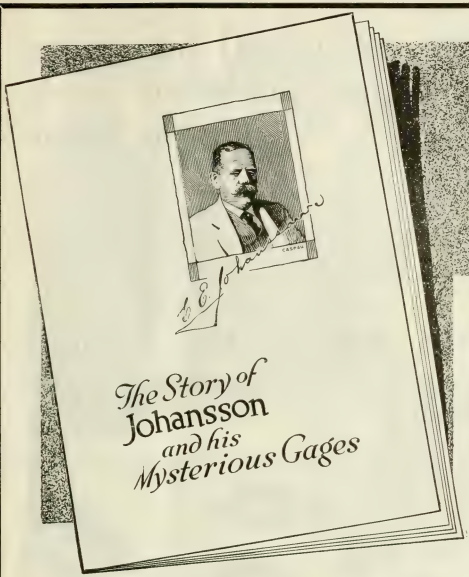
Make certain that the lubricant used for each operation in your shop is the best obtainable for the purpose. Otherwise your men and your tools and your machines work at a disadvantage.

Write us to-day that we may demonstrate how Cataract Lubricants can increase production and reduce cost in your plant.

Cutting Compounds
Drawing Compounds
Cutting Oils
Quenching Oils

Cataract Refining Company, Limited - Toronto, Ont.



FIRST-TOLD facts about Johansson and the years of trial and disappointment he went through in creating and perfecting his remarkable system of gaging.

Where is the shopman who has not wondered just who Johansson is, what he is like, how he works and produces his mysterious Gages?

Where is there a designer, draftsman, toolmaker superintendent, foreman, or inspector that would not like to know more than he does about Johansson, the unassuming toolmaker who has revolutionized the world's standard of precision and accuracy?

For the first time the story is published for free distribution—in a neat little pocket size booklet, shown above.

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The first edition of this free booklet is limited. Get your request in early—to avoid disappointment.

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You will enjoy reading the only authentic story of Johansson ever published in America. You will find it a booklet you will be glad to keep.

CONTENTS

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The Toolmaker Who Searched For Accuracy.
Solving the "Impossible."
Accuracy Almost Beyond Imagination.
What is 0.00001"?
Johansson Accuracy Once Doubted.
Flat Surfaces in Steel.
Parallel Surfaces in Steel.
Accuracy as to Size.
Treatment of the Steel.
The Limit System.
100% Perfection—Is It Possible?
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Yes or No.
Effect of Johansson's Work Upon Industry.
Of What Use is Accuracy?
Who Has the Correct Measurement?
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Gentlemen:—Kindly send me "The Story of Johansson and His Mysterious Gages.

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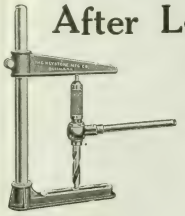
"Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.

The Keystone Mfg. Company

Buffalo, N.Y., U.S.A.

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Never-Slip Wrench

It works in hard-to-get-at places—in places where a straight handled wrench could not be used. It is specially designed for pipe and nut work, and is easily operated and handled by one hand.

The sliding Jaw is a steel drop forging. The operating nut is steel. All parts are interchangeable.

All B. & C. Tools are as good as this Never-Slip Wrench—and we cannot make it better.

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For High Grade Springs

For War or Peace Delivery

We offer a highly specialized spring production service—the result of 60 years' practical work. In design, metal, quantity we can give just what is needed. Write us, we may be able to be of service.

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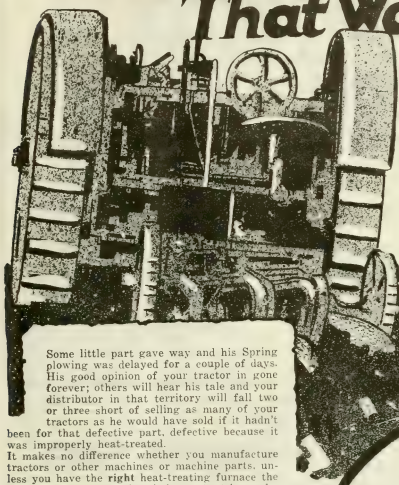
-And I Always Thought That Was A Good Tractor-

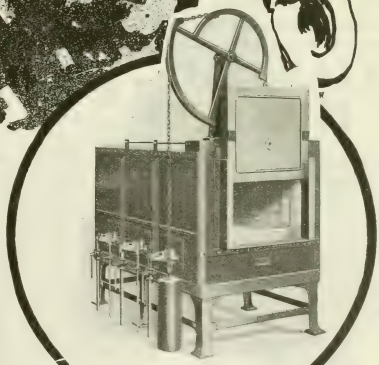


Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

It makes no difference whether you manufacture tractors or other machines or machine parts, unless you have the **right** heat-treating furnace the reputation of your product is in constant jeopardy.

You Cannot Afford to Take Such Chances

GILBERT & BARKER
Heat - Treating Furnaces



insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & B. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform **always**, the result is a finished product of maximum tensile strength which will stand up under the hardest usage.

The operating cost of G. & B. Furnaces is extremely low.

Send for Bulletin 24. Let our Engineers suggest the furnace that is best suited to your requirements.

To-day is a better day than to-morrow—write.

Gilbert & Barker Mfg. Co.

Established 1865

SPRINGFIELD, MASS, U.S.A.

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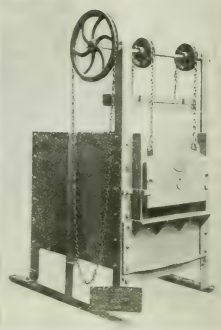
To Your Sense of Economy and Efficiency?

It's economy — requires one-half the space; costs less than half; no chimneys or flues required; instantaneous and perfect control of temperature; higher temperature obtained; no coal ash handlers required; no coal or ash piles; less waste of fuel, because it is shut off instantly; requires much less time to get the required heat. *Can you afford to lose the Advantages of this oil Furnace?*

OIL FURNACE
VERSUS
COAL FURNACE



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OIL or GAS

Prompt delivery on all tool room types.

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Broach Hardening Furnace

Furnaces built for special requirements

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ECONOMIZER FORGE

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into forge shop.

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Furnace Engineers and Contractors
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AUTOMATIC MILLING MACHINES

HORIZONTAL VERTICAL

EVERY working part of this machine is built with a view to **increased production.**

CONTINUOUS MILLING

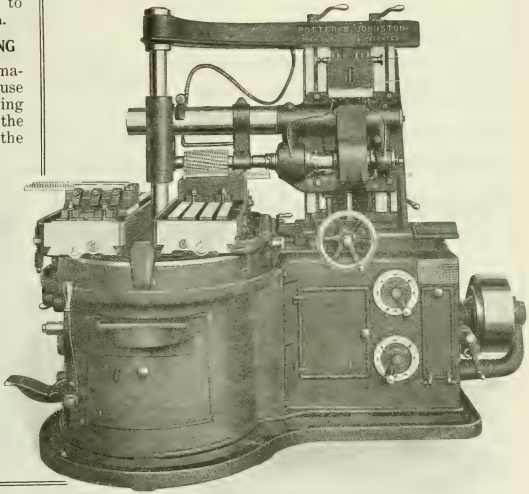
No lost time due to machine idleness because the operator is loading one fixture while the cutter operates on the other.

16 Table Feeds, 7/8 in. to 12 5-16 in.

Length of Table Feed, 28 inches. 12 Spindle Feeds, 20 to 180 R.P.M.

Send us your Blueprints and we'll gladly give you production figures.

Bulletin 36 on application.



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Especially made to drive high-speed drills up to 3" diameter, for drilling and boring tools up to 8" dia. for boring out cored holes in cast iron.

Value shown by the lateral and vertical adjustment which operates anywhere on a surface 18" high by 36" wide.

Also for Finest Jig Work.

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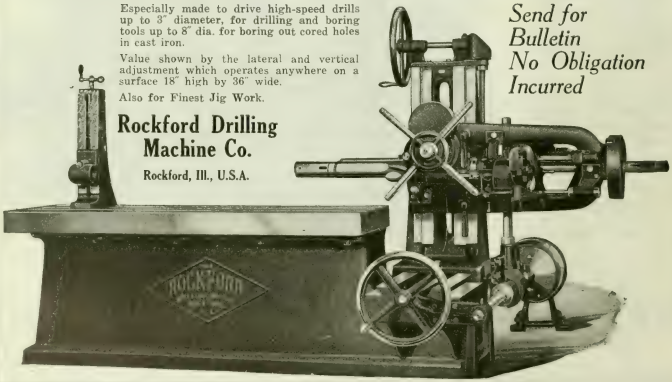

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Indicating Recording Controlling

Our Work in the Marine Field

is to meet its every temperature instrument need

Tycos Temperature Instruments are especially designed to fulfill all demands for accurate temperature indication and reliable temperature records.

The many years of interesting experiments and careful manufacture down to the smallest detail, have raised the prestige of *Tycos* heat indicating, recording, controlling instruments to the highest level.

Let us place our literature within easy reach—by permitting us, you may be led to investigate some of our products at your leisure.

Tycos Type Angle and Straight Stem Thermometers
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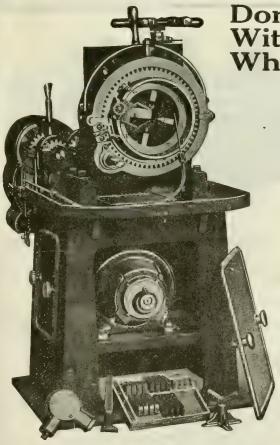

Don't Talk Man Shortage With Six Men on Pipe Work Where There Should be One

Don't let urgent work lag for the want of men while you employ a gang of men instead of one man and a

Forbes Pipe Cutting and Threading Machine

on your pipe work.

The old-style stock and die method of cutting off 15-in. pipe required six men. It can now be done with one man and a Forbes Machine.

The motor-driven type follows the pipe-fitting work wherever an electric wire can be run. No hauling of heavy pipe to and from a stationary machine.

In the Forbes Machine the dies revolve. The pipe remains fixed in the self-centering vise. And the threads cut! They're the kind that make tight joints, because they're clean, accurate.

Write to-day for our catalog.

The Curtis & Curtis Co.
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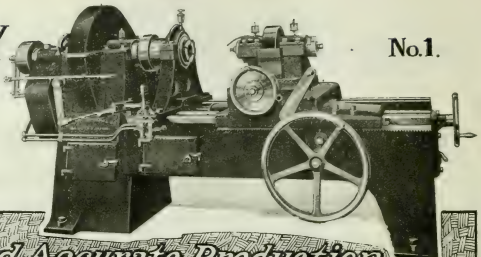
SMALLEY No.1.

General Thread Milling Machine



For Fast and Accurate Production

Investment in labor-saving devices is not an expense. The real expense is the constant daily leak through the pay roll. The **Smalley General Thread Miller** is the great economizer of human effort. Its accuracy, its convenience and speed justify the investment of capital necessary to its installation wherever quantity thread milling is done. This modern machine tool has two speeds and will mill in one minute 2 to 12 inches, or turn 15 to 30 feet. Pay you to write for full description of this cost-cutter.

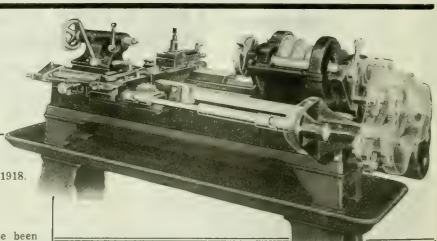
Smalley-General Company, Inc., Bay City, Mich.

Canadian Agents: Rudel-Belnap Co., Limited, Montreal and Toronto

One Customer Says:

"We have the best Lathe in The City of Cleveland to-day"

READ THIS LETTER



B. & W. TOOL & DIE CO.
102 St. Clair Avenue, N.W.
Cleveland, Ohio, Nov. 19th. 1918.

Mulliner-Edlund Tool Co.,
Syracuse, N.Y.

Gentlemen:—

Since installing your 12" Lathe, we have been practically running on Thread Gauges, Taps and Dies, since the 1st of June this year. All of our work has been subject to the Bureau of Standards Inspection, we have readings in our files which are open to inspection to anybody and in any of these readings, we do not find a greater lead error than .0003 in ten to twenty threads and in many cases, absolutely nothing. Our pitchers range from 12 to 40. We consider that we have the best lathe in the City of Cleveland to-day and this statement can be verified by the local Bureau of Standards.

We desire to thank you for the very courteous service furnished us through your Mr. Bull and we feel his personal attention has been instrumental in the successful service your lathe has given us.

With best wishes, we are,
Yours truly,
B. & W. TOOL & DIE CO.
By J. A. Walton

JAW C"

This is the Kind of ACCURACY for Your Tool Room Work

Great Strength and Rigidity, too, Characterize the

MULLINER QUICK CHANGE LATHE

The quick change mechanism gives 37 different threads and feeds. Another feature is the ring self-oiling system.
Sizes, 12-in., 14-in.; beds, 4-ft., 5-ft., 6-ft. **Send for the full details of this ideal precision tool.**

Mulliner-Enlund Tool Company
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"Matthews-made" steel stamps and lettering dies make easily read and durable marks on all classes of products. Matthews Champion Type Holders—for flat and convex surfaces—with interchangeable Steel Type, save time and lower marking costs. Matthews Inspection Hammers of best Pittsburgh Steel, are fashioned with the "know how" of over 50 years' experience.

Booklet "For Light and Heavy Marking" sent on request. Write for a copy of it.

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Hydraulic and Hydro-Pneumatic Quick Operating Presses for Straightening, Forcing and Broaching operations.

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Notes on Grinding

NORTON COMPANY, WORCESTER, MASS.

No. 42A

Keeping the Wheel in Condition for Knife Grinding

The usual method of dressing the grinding wheel is by means of a Crystolon stick. The wheel face is touched lightly from time to time, the frequency depending upon the action of the wheel in use. The grinding wheel face is thus sharpened, or in other words, the dull grains are removed and new sharp, abrasive particles are presented, which in turn give more satisfactory results. It is possible also for a skillful operator to restore the shape of the wheel face with one of these Crystolon sticks.

One of the greatest objections to some of the old types of knife-grinding machines was the use of a wheel with too small a diameter. Each shop or mill usually has a certain standard length of bevel, depending upon the wood to be cut, which is measured by a gauge, and the knives must be ground accordingly. When the grinding wheel has worn an inch or more in size, the bevel produced on the knives naturally became so concaved as to weaken the cutting edge considerably. This condition is being eliminated in the modern machines through the use of larger wheels.

On the modern knife-grinding machines 30 or 36, grades J or K, Alundum, vitrified or silicate wheels will be found almost universally satisfactory. The grain and grade depend somewhat on the size of the wheel. Very little dressing is required, and a cool, rapid-cutting action is given, with a reasonable feed and traverse. Occasionally it is necessary to use wheels as soft as grade I or even H, but this is unusual.

NORTON COMPANY

Canadian Agents:—The Canadian Fairbanks-Morse Co., Ltd., Montreal Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

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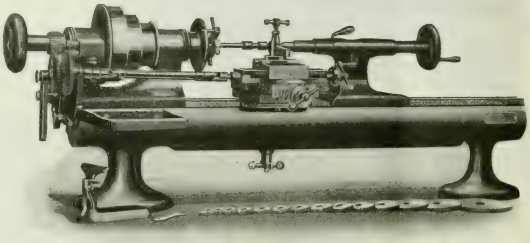
Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

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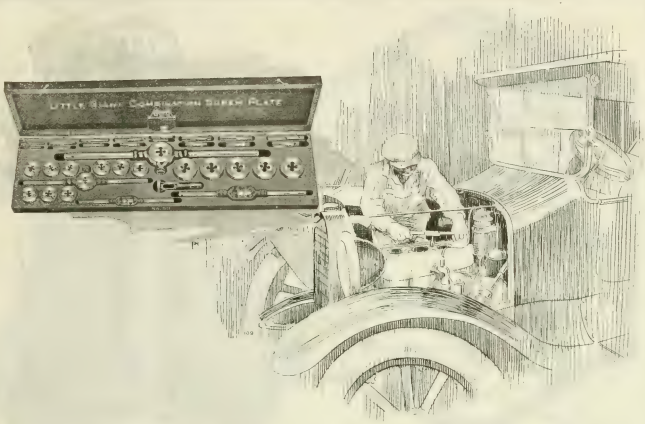

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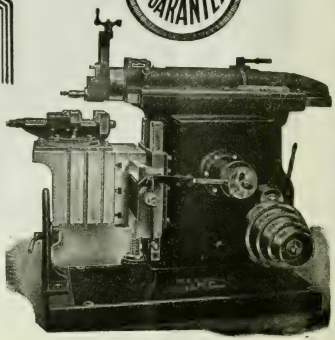

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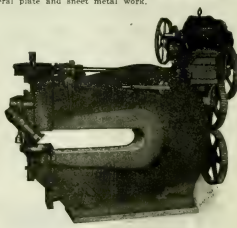

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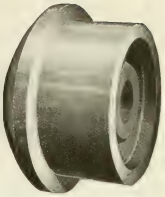

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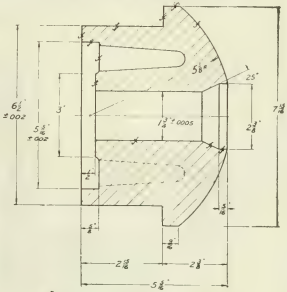

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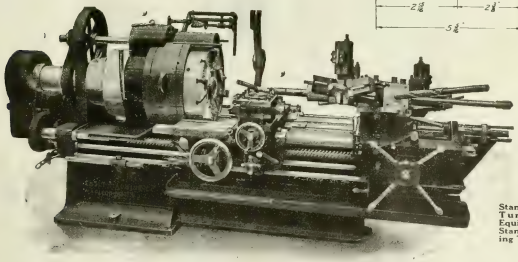

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXI. No. 17. April 24, 1919

Manufacturing the Banner Hosiery Machine-III

A Further Instalment on the Two Previous Articles on the Subject of the Construction of These Interesting Machines

By ROBERT MAWSON

IN the previous instalments of this article we have discussed at some length various fixtures and methods used on Jones and Lamson automatics. The Hemphill Manufacturing Co., Pawtucket, R. I., have also designed many fixtures for use on the milling machine, and some of these will be illustrated and described in this section.

In Fig. 1 is shown the operation of form milling the sinker cams on a Briggs milling machine. This type of machine is admirably fitted for work of this nature.

It will be seen that the arbor which drives the cutter is well supported on the outer end in a long bearing of large diameter, thus reducing any danger of chattering and permitting a good feed to be taken.

The sinker cams are made from a special mixture of chrome vanadium steel. The fixture is of simple construction, being a special set of jaws attached to a milling machine vise which is located by tongues and held on the machine table by means of two bolts. The vise jaw type of fixture is not used as much as it might be; it has the advantage of being cheap in construction and may be adapted very well for almost any part, having a flat section as well as other simple elements. After the jaws are once tightened the pieces are always held rigidly for the machining operation. In this fixture fifteen parts are held in one setting, being located by a stop plate on one end against which they are pushed by the operator.

The table is then raised to the correct height and the revolving form cutter machines the proper contour on the pieces. In the illustration Fig. 2 is shown the fixture used when milling the middle pulley. The casting is located by a plug which fits into a previously reamed hole.

After the pulley has been dropped into position a socket wrench is placed in the square shown in the centre of the plug and as this is of the expansion type a slight turn expands the locating plug and holds the pulley securely. The slot shown, which is ½ inch wide and 5-16 inch deep, is then machined, using a side milling cutting of the same width as noted, the operation being performed on a horizontal milling machine. The fixture is located by tongues and held on

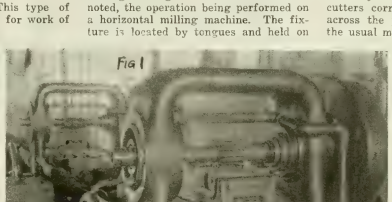


FIG. 1 FORM MILLING THE SINKER CAMS

the machine table with bolts fitting in the slots shown at the ends of the fixture. The gauge used to test the correctness of the machining operation is shown at the left of the fixture.

Milling the Instep Raise Cams

The next half-tone is very interesting, being the fixture used for milling the instep raise cams. These pieces are machined with a groove down the centre in a previous operation.

The clamps, twelve in number, are made with a tongue of the same width as this milled groove, and as the cams are pushed in from the end of the fixture the tongue is used as the locating medium.

Each clamp is wide enough to hold two pieces as shown, and after the bolts are tightened down the cams are both located and held accurately and securely.

The fixture is again located by tongues and held on the horizontal milling machine by means of bolts. Two angular cutters correctly placed are then fed across the pieces, the table feeding in the usual manner.

The desired contour on both ends of the cams are thus produced in one operation on top of the fixture and also in front may be observed some of the finished machined parts.

The half-tone Fig. 4 shows the fixture used when straddle milling the stitch cams. This work is performed on a horizontal milling machine, two fixtures being mounted on the table at once, one holding a left hand and the other a right hand piece.

The cam is located by four pins A, the piece fitting inside these pins. At B the fixture is provided with an expansion by tightening the screw in the plug which expands the stitch cam is held securely.

The two fixtures are set vertically on the machine table in the position shown, being located by tongues and held down by means of bolts. The sides or edges of the cams are milled in this fixture, the cutters being correctly spaced to obtain the proper width.

By referring to the illustration it will be seen that the fixture is made with a recess on each side of the stitch cam when in position which enables the cutters to machine the part without interference. The table is then moved across

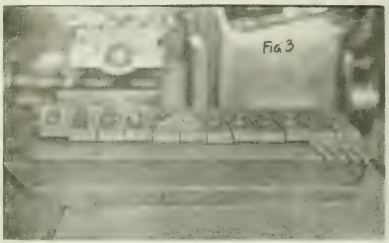


FIG. 3 FIXTURE FOR MILLING THE MIDDLE PULLEY

to the fixture holding the other hand of cam and the operation repeated. In front of the fixture is shown two of the stitch cams which have been milled in this fixture.

Cutting Raise Cams

The half-tone Fig. 5 shows the interesting and somewhat unusual method of employing an index head for a milling fixture. This tool is used for sawing apart the raise cams.

These pieces are made from tool steel rings which have been machined all over to the required dimensions. On the spindle of the index head is attached a large plug, the outside diameter of which is a good sliding fit for the bored hole of the ring.

The cam ring is then placed on this plug and held securely by means of the nut A. The table is afterwards raised to the proper height so that the saw B will pass through the ring section. The table being fed against the revolving saw type milling cutter the first slot is machined and the table fed back so that the cutter is clear of the fixture. The index head is then revolved and of course this turns the ring to the next position determined by the index plate and dial and the machining operation repeated. By this method all the sections cut from the ring are similar in length.

At D is shown one of the rings before being sawn apart, and at E two of the sections cut from a ring, each of which makes six sections.

The illustration Fig. 6 shows the fixture used when straddle milling the clutch forks It will be noticed that the fixture is designed to hold two forks, one in each vertical arm. Under these conditions the operator is inserting a fork at one end whilst another is being machined, thus making the milling operation practically continuous.

The fork is placed in a hole A which is made a snug fit for the shank of the piece. An adjustable parallel is then placed under the fork which projects out of the fixture and the parallel is slid under until the surface of the piece is horizontal. The set-screw B is then tightened on to the shank, thus holding the fork securely. The piece is then straddle milled with a ⅜ inch radius and to .250 inch thick, using the gang setup of three cutters shown. Two of the finish milled clutch forks are shown resting against the fixture.

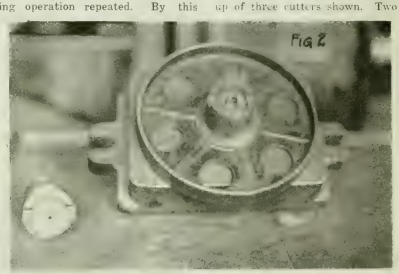


FIG. 5 MILLING THE INSTEP RAISE CAM

Milling the Fashion Cams

The fixture shown in Fig. 7 is used for milling the fashion cams. This tool is designed to hold 36 pieces at one setting which are located on the pins shown one on each side of the vertical arms of the fixture. The cams are then held in position on the fixture by means of clamps, some of these being shown on set-screws of the tool.

This is located by tongues and held on a horizontal milling machine by means of bolts fitting in the slots at each end of the fixture. The table carrying the pieces is then fed against a revolving face mill and the ends of the cams milled at the correct angle and at the proper distance from the reamed hole used for locating them on the tool. One of the finish milled fashion cams is shown resting against the fixture at A.

The half-tone Fig. 8, shows the fixture and operation of milling the angles on the stitch cams. This work is being performed on a Van Norman duplex milling machine with the head set vertically as shown. The fixture proper is made from a rectangular iron block held between the jaws of the milling machine

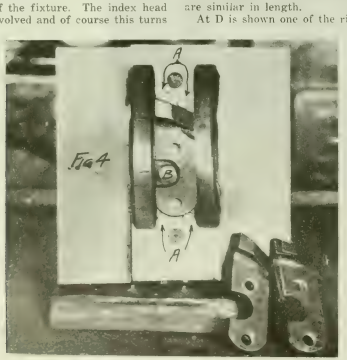


FIG. 4 STRADDLE MILLING THE STITCH CAM

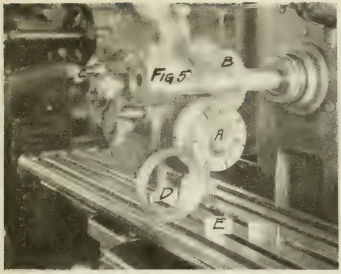


FIG. 5.—CUTTING THE RAISE CAM

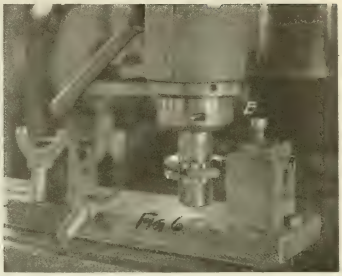


FIG. 6.—STRADDLE MILLING THE CLUTCH FORK

vise. In this block are machined two angles A, a counterpart of those which the stitch cams must have.

The cams, one right, the other left hand, are located in the fixture by means of pins which fit accurately in two previously drilled holes. After two of the pieces have been located the strap B is swung back, being held with the set-screw C. The two screws D are next tightened on to the stitch cams, thus holding them securely in the fixture.

The table and fixture are then fed under the revolving end mill E and the angles on the cams machined. In front of the fixture may be seen two stitch cams, one right and one left hand which have been machined on their angular surface in this operation.

In the illustration Fig. 9 is shown the fixture and method used when facing the pad on the 104-tooth gear. The gear has been previously turned on its periphery, the hole bored and the hub faced to the correct width.

The casting is located by means of a pin which fits into the bored hole and through holes in both vertical walls of the fixture. A pin is also placed through the front vertical wall and into the slot shown directly above the large bored hole. The function of this latter pin is to hold the gear in a convenient position for the milling operation.

The fixture is located on the table by means of tongues to ensure the machined pad being square with the bored hole in the gear. Bolts at each end of the fixture hold it securely on the milling machine table. The pad is then faced off to the correct height with the revolving end mill A. At B is shown one of the gears which has had the pad faced in this fixture.

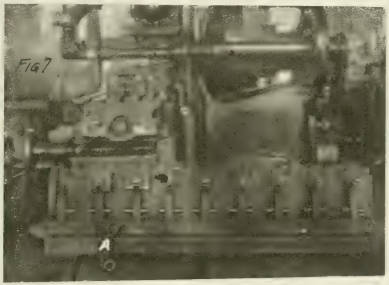


FIG. 7.—MILLING THE FASHION CAMS

Milling Oil Pans

In Fig. 10 is illustrated the fixture and milling machine set-up for machining for pads on the upper side of the oil pan. The casting is located by being pushed against the inside of the two clamps shown at the right and one at the left of the fixture screws through these clamps are then tightened onto the oil pan. Two straps, one on each end, are also fastened as shown to assist in holding the piece. By using these five holding mediums the oil pan casting is held rigidly on the fixture, enabling a better finish to be obtained with the cutter.

The end mill shown is used to machine the four pads, the table being set so that the correct height will be obtained. In front of the fixture is shown an oil pan with the pads finish milled with this operation as described.

The half-tone Fig. 11 shows the other milling operation on the oil pan. This is machining the various bosses on the lower surface. The fixture used for this operation and shown in the illustration

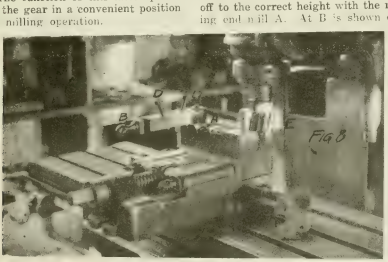


FIG. 8.—MILLING THE ANGLES ON THE STITCH CAM

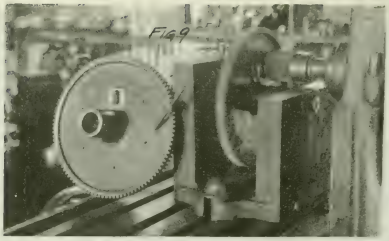


FIG. 9 FACING THE PAD ON 1917 GEAR

is provided with three locating pins on which the casting rests.

Three clamps are then tightened to hold the piece securely on the fixture. Two of these holding devices may be seen at A. It is obvious that a clamping device at the rear of the fixture would be very inconvenient for the operator to manipulate if made with a set-screw as those shown at A. To provide a quick and easy method of fastening the third clamp it is operated by means of a long screw, at the outer end of which is the knurled knob B. Therefore, after the operator has tightened the clamps A by simply turning the knob B the rear clamp is operated, thus holding the oil pan down with three fastenings. The cutter C used for the operation is somewhat unusual, being 12 inches wide, made with spiral teeth and about 1-16th of an inch of metal is removed. The surface produced is smooth as shown by the finish machined oil pan in front of the fixture and a true face is also obtained by using this manner of tooling.

Milling Clutch Cams

The half-tone Fig. 12 shows the fixture set up on the machine for milling clutch cams. These parts are made from cold rolled steel 11-16 in. wide by ¼ in. thick.

The fixture is designed with a slot slightly larger than the rectangular bar and deep enough to accommodate seven pieces at one setting. The bars are slid in from the end A and pushed back against the stop B. The two clamps C are next swung over the bars and being tightened down hold them securely in the fixture. The milling saw D used is back out of the path of the milling saw. The table is then fed along for the second cut, the saw passing through the slot G. By this method, the first cut machines the rear end at an angle with the longitudinal axis of the bar and the second cut is straight with the axis. One of the sections of bar cut in this fixture is shown in front of the tool at H. The picture Fig. 13 shows the fixture and milling machine as used when machining the clutch tooth slot.

The gear has been previously bored, turned and the teeth machined in previous operations. The piece is located in the fixture by means of a pin which fits accurately in the bored hole. The two clamps A hold the gear on the fixture, which is itself held in the jaws of a milling machine vise as shown.

The slot is produced with the form cutter B, the table being set so that it will pass through the centre line of the gear. When the table has been adjusted to the correct height it is fed across against the revolving form cutter and

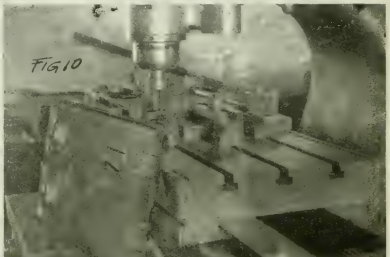


FIG. 10 MACHINING THE PADS ON UPPER SIDE OF OIL PAN

10 in. in diameter and 3-16 in. thick. The table is first fed along and the cutter mills through the slot E with the index pin against the stop F.

The index pin is next pushed against the stop G after the table has been fed the slot machined on both sides of the hub, the illustration shows the beginning of the operation.

In the next section we will illustrate and describe some of the special tools and methods employed when machining the frame of the hosiery machine.

See cuts on page 395

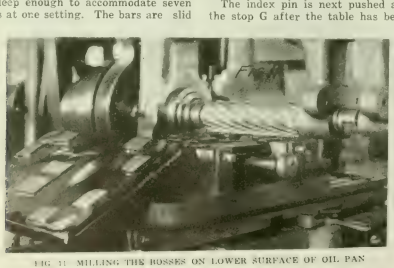


FIG. 11 MILLING THE BOSSES ON LOWER SURFACE OF OIL PAN

Canadian Trade for Australia.—Speaking recently at a meeting of the Board of Trade of Hamilton, W. A. Lingham, a broker of Sydney, N.S.W. emphasized the necessity of Canadian business men making a bid for Antipodean trade. He cautioned them that United States merchants were getting busy in this field, and would corral the whole of the business if prompt measures were not taken to compete with them. The opening of a Canadian branch bank in Australia and a marine insurance office to look after marine risks would be a step in the right direction from Mr. Lingham's standpoint. He also counselled the use of an advertising campaign.

The Machine Tool Designer Speaks Up

A Criticism on the Article Entitled "Technical Education Plus Horse Sense" Which Appeared in a Former Issue of "Canadian Machinery"—This is Worth the Reading

By J. H. HARRISON

ABOUT the best proof required that CANADIAN MACHINERY is read intelligently by its readers comes to hand in the following article, which is a direct reply to the article by R. Mawson, which to the author of this article at least, seemed to hit at the machine tool designer. This article is well worth reading for the author's views are placed in an open, frank manner, but we will let readers judge for themselves, so now to read in the author's own language his views on the subject.

Regarding your article, "Technical Education Plus Horse Sense," which appeared in March 27 issue, I note this article was written by R. Mawson, and while the author of this article has no personal animosity toward Mr. Mawson, still there are several statements which in the article spoken of will not bear close examination, and with the viewpoint of the machine tool designer in mind I will endeavor to point out why I cannot agree with your former article.

If such a lathe as mentioned in paragraph 6 were manufactured with change gears and shifting mechanism inaccessible for operation and repairs, would not the whole machine be considered of poor design, irrespective of whether it stood up to the work or not? With such essential features as these of poor design, it certainly could not be said to be of good design.

How any reliable machine tool manufacturer would allow a young man with a technical education only and no experience, a mere beginner we may say, to design a machine tool is beyond comprehension, and the result of any mistakes that he would make should be blamed on his employers for maintaining an inefficient shop organization.

From this article one would judge that these mistakes were made by a draftsman or tracer, lacking in experience, and not by a designer, for a designer is one who develops the idea of a device or machine for accomplishing a definite purpose and is able to proportion correctly the parts as to strength, appearance, and requirements of shop practice. While a draftsman may only be able to take the completed design and work out the details, he must, in some measure, be able to design. There is no sharp or clearly-defined line between the work of a draftsman and the work of a designer, for while a designer is always a draftsman, it does not follow that a draftsman is always a designer.

The above remarks also apply to this statement that "if the designer had received some practical training in the foundry and machine shop, he would have seen the foolishness of designing such a piece." Again I repeat that a designer must have a good working knowledge of the methods and practices employed in the shop.

A designer must have originality and ability to adapt former inventions to the work in hand, and also an open mind, so that he can make use of the ideas presented to him from whatever source they may come. But he must also be on his guard so that he will not have his mind prejudiced by taking, without due analysis, the advice of the knights of the overall.

To illustrate this, take the actual case of where the design of a special machine of an entirely new type was under consideration. The opinion of the shop foremen and other practical men was asked, with the result that in their opinion the design was impractical and ridiculous. However, the designer prevailed upon the management and was allowed to try his idea, the outcome of which was that the machine was more cheaply manufactured, more efficient, and altogether a huge success.

To be fair to the designer, we should not blame him for the mistakes of the draftsman or tracer, and also we should not accuse the draftsman of lacking "horse sense" until we have investigated and are sure that he has had sufficient experience for the work in hand.

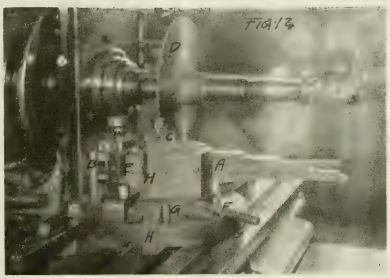


FIG. 12 MILLING THE CLUTCH CAMS

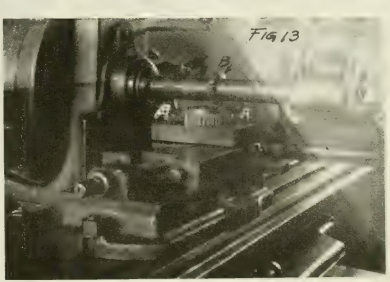


FIG. 13 MACHINING THE CLUTCH TOOTH SLOT

Heat Treatment of Low-Carbon Steel

In the Following Paper, Read Before the Toronto Section of the American Society of Mechanical Engineers, the Author Treats of the Characteristic Structures Found in Steel, Their Formation by Heat Treatment and the Effect Each Has in the Quality of Steel

B. W. M. WILKIE

STEEL is made up of iron combined with certain percentages of carbon, manganese, silicon, phosphorus, sulphur and other elements, each one of which by its presence in varying quantities imparts some special quality to the steel. It is, however, the writer's intention to confine himself to a study of the more usual combinations of iron and carbon that exist in low-carbon steels, for the whole subject of heat treatment is really a study of the different forms or phases in which the various combinations of iron and carbon exist, and the conditions under which they are formed. That is, knowing the particular quality a certain form or phase imparts to steel, and the treatment required to produce it, we are in a position to prescribe the treatment necessary for producing steel of any desired quality.

From microscopic examinations of polished and etched sections of steel, it has been found that there are a number of characteristic structures under which steel exists, each being the result of some special treatment. To determine these characteristic forms and the reason for their formation, a study should be made of the different kinds of treatment that steel receives in ordinary commercial practice. These may be divided as follows:

1. Unworked steel, i.e., cast steel, cooled slowly, cooled rapidly, and reheated.

2. Hot-worked steel, cooled slowly, cooled rapidly, and reheated.

Cast Steel Cooled Slowly

In molten steel the carbon exists as chemical compounds of iron and carbon of varying composition, called carbides. The most common of these has the composition FeC and is called cementite. These carbides are found dissolved in the molten iron in the same way as salt is dissolved in water; also as the steel solidifies, the carbides continue in solution and form what is known as a "solid solution."

The solid solution of iron and the carbide FeC is called austenite, and is the usual form or phase that iron is found in just after freezing.

Austenite, owing to its instability at lower temperatures, is rarely ever found in steel unless special precautions are taken, such as by cooling very rapidly from temperatures above 1000 deg. cent. (1768 deg. fahr.) It has a crystalline structure, which becomes coarse the slower the steel is cooled, due to the fact that as no mechanical work has been done on the steel, adjacent crystals tend to assume the same orientation and merge into a larger crystalline grain. Such slowly cooled, coarse-grained steel is brittle, has minimum tenacity and toughness, and can only be used where it is possible to make up strength by using large masses of metal.

Along with the growth in the size of the grains, the rate of cooling is uniform until a temperature somewhere between 900 deg. cent. and 700 deg. cent. (1652 and 1292 deg. fahr.) is reached. At this point the rate of cooling is gradually retarded, until finally the temperature becomes either stationary or even slightly higher. After a short interval the temperature will again fall at a gradually increasing rate until it becomes uniform, at which it continues to cool to atmospheric temperatures.

The explanation of this peculiar phenomenon is that a change occurs in the structure of the steel during this change of temperature, caused by the austenite, now having reached a temperature at which it is no longer stable, proceeding to change into the more stable phases of lower temperatures. This change is accompanied by a liberation of heat, which explains the change in the rate of cooling. A similar but reverse action takes place when steel is being heated.

The range of temperature within which this change occurs is called the critical range, while the upper and lower limits of this range are known as the upper and lower critical points. The lower point is about 690 deg. cent., (1274 deg. fahr.) for all percentages of carbon content, whereas the upper point ranges from 900 deg. for pure iron to 690 deg. for steels containing 0.85 per cent. carbon. These points also vary slightly with the amounts of other elements besides carbon present, also depending on whether the steel is being heated or cooled. The critical range and its limits are important points to remember in heat treatment, and it is necessary to become thoroughly familiar with the reactions that occur in this range.

The slow-cooling steel under consideration has now reached the upper critical point where the martensite is no longer stable and begins to change into some more stable form such as pearlite, ferrite or cementite.

Pearlite is a definite mechanical (not chemical) mixture of the carbide FeC with pure iron or "ferrite," with a carbon content of 0.85 per cent. Steels having such a carbon percentage will, after annealing, be all pearlite and are known as "eutectoid" steels. If the carbon content is *less* than 0.85 per cent., all the carbon is combined with iron to form the carbide FeC, or cementite, which by the addition of a further amount of iron immediately is converted into pearlite, while any excess iron is left free. Such steel is called hypoeutectoid steel, and consists of pearlite and ferrite when in the annealed condition.

If the carbon content is *over* 0.85 per cent., there will be an excess of cementite over the amount required to make pearlite from the free iron present, and so we have the two phases, cementite and pearlite, when the steel is annealed. Such steel is known as hypereutectoid steel.

Pearlite is a constituent of all slowly cooled steels, the greater the proportion of carbon—and hence of pearlite—the stronger and tougher and less ductile will be the steel, until the eutectoid composition is reached, when the steel has maximum strength, as all additions of carbon above this composition only result in the formation of cementite, which has no strengthening power.

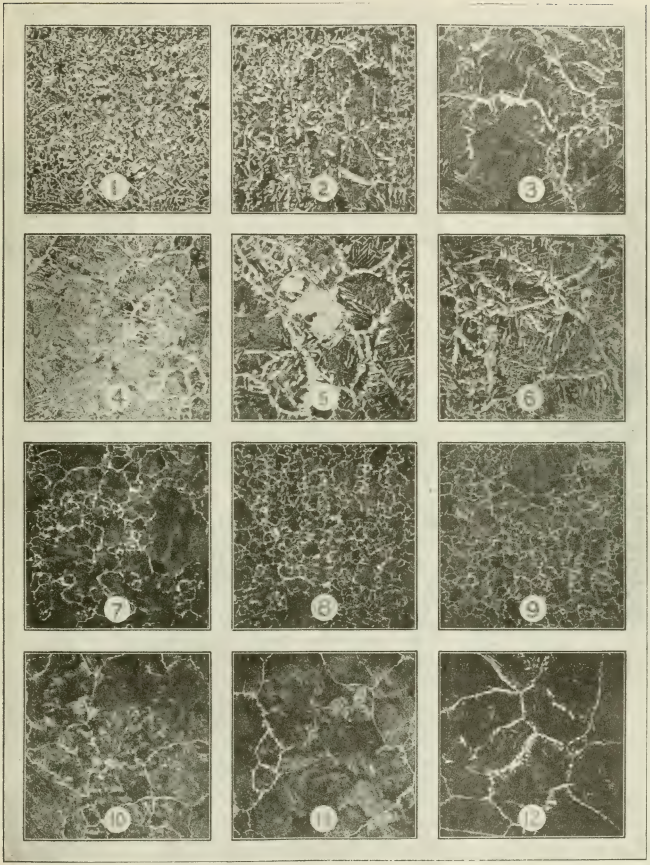
Pearlite also by its ability to take up free ferrite and change into austenite is the hardening consituent of steel, so that eutectoid steel is the composition that has maximum hardening powers, though eutectoid steels are not necessarily the hardest, as hypereutectoid steels may be harder as the result of the hardness caused by the presence of cementite.

Ferrite is the name of pure iron and it is the constituent of all low-carbon slowly cooled steels. It is very soft, ductile, relatively weak, and has no hardening power.

Cementite is a substance about which little is known. It is a definite chemical compound, FeC, and it may be assumed that it is very hard and brittle, and therefore lacks tenacity and ductility. It has no hardening power beyond the extreme hardness it itself confers on the steels.

The properties of these three constituents of steel as given by Howe are set forth in Table 1.

When the slow-cooling steel has reached the upper critical point, it will be coarse grained because of the very slow cooling. At this point each grain of austenite tends to transform into the pearlite composition by throwing off the excess ferrite or cementite it contains, and if the cooling is carried on with sufficient slowness, it will be found that by the time the lower critical range is reached each original grain of austenite has changed into the pearlite or eutectoid composition, while the excess iron in the hypoeutectoid steels, or the excess cementite in the hypereutectoid steels, has been liberated as follows:



FIGS. 1 TO 12. PHOTOMICROGRAPHS, SHOWING CHANGE IN GRAIN STRUCTURE CAUSED BY ANNEALING TO VARIOUS TEMPERATURES. SEE NOTES UNDER TABLE 3.

TABLE 1—PROPERTIES OF CONSTITUENTS OF STEEL

Constituent	Tensile strength, lb. per sq. in.	Elongation, %	Hardness	Hardening power
Ferrite	50,000	10	Soft	None
Pearlite	125,000	10	Hard	Maximum
Cementite	5,000?	0	Very hard	None

1. As a film or envelope around the original grains.
2. Between the cleavage planes of the crystalline grains.
3. As a combination of both.

The first form results with fairly rapid cooling, whereas the second form is the result of very slow cooling.

As the steel cools past the lower critical range the changes are all completed, and any further cooling has no effect on the internal structure, provided it is not rapid enough to set up strains.

Having followed the changes in a slow-cooled cast steel, it is found that the final condition is a coarse-grained, softened steel, which owing to its coarse-grained structure lacks strength, toughness and ductility, but is relatively soft, and has for its constituents the phases pearlite, combined with either ferrite or cementite, depending on the carbon content.

Cast Steel Cooled Rapidly

In cooling steel very rapidly, by quenching it in oil or water, we find marked differences from the slowly cooled steel. First, the grain structure is finer, the growth of the grains being prevented. Second, the steel is very hard and brittle, because the reaction in which austenite transforms into pearlite, with a residue of ferrite or cementite, can only take place completely when the cooling is very slow. If the steel is cooled rapidly, the reaction only partially takes place, and as a result there are a number of new phases formed which are really part-way transformations between the austenite phase and the phases of soft steel.

The most important of these forms is martensite. This is really an allotropic form of austenite, whose most characteristic features are its needle-like structure, with the crystals crossing each other at 60 deg., and its extreme hardness. It is formed by quenching steel in water, if the pieces are fairly large, or in oil in case of small objects, from above or near the upper critical point. This rapid cooling causes rapid contraction, which sets up great pressures and results in the crystals assuming the structure indicated above.

Martensite is the form or phase giving maximum hardness to steel, so that the more rapid the cooling and, consequently, the greater the amount of martensite, the harder and more brittle will be the steel. Extremely brittle steel is, however, of very little use commercially.

If the steel instead of being quenched in water is either allowed to cool slowly to the middle critical range and then quenched, or is quenched in oil in case of small sections, another form, called troostite, is formed. This is a further stage in the transformation from austenite into pearlite, i.e., the grains have gone a step further toward reaching the eutectoid composition. Troostite occurs in dark-colored, irregular areas or nodules, and is nearly always accompanied by martensite and sorbite. It is slightly softer and has more ductility and toughness than martensite.

If the steel instead of being quenched in oil or water is cooled rapidly in air, or a large piece of steel is quenched in oil, a new constituent called sorbite is formed, which is another stage in the transformation of austenite into pearlite. It is considerably softer than martensite, and in fact is not a constituent of hardened steel. Its properties more nearly approach that of pearlite, i.e., it is stronger harder and less ductile than pearlite, but softer and more ductile than troostite. Its composition also approaches more closely to the pearlite composition than the solid solution of iron and ferrite found in austenite; in fact, sorbite is the last stage in the transformation from austenite to pearlite.

Accordingly, unworked steel cooled slowly contains the phases of soft steel, but owing to the coarse-grained crystalline structure it is brittle and lacks strength and ductility. Similarly with rapidly cooled unworked steel the rapid cooling tends to retard the growth of large grains, but unless great precautions are taken to cool the steel very rapidly, it will still have a fairly coarse granular structure, which, combined with the brittleness caused by rapid cooling, leaves a material having little commercial value.

Cast Steel Reheated

To overcome these difficulties it is necessary to give the steel some special heat treatment—in this case, annealing. Theoretically, in annealing the steel should be heated to the upper critical point, and then cooled slowly, but the rate of cooling has to be varied, depending on the particular steel required.

The theory of this treatment is that as the steel is heated above the lower critical point, the phases of softened steel, i. e., pearlite, ferrite, and cementite, tend to change into austenite. This reaction continues through the critical range accompanied by the absorption of heat which causes a retarding in the rate of heating, similar but opposite to the action in cooling, and when the upper critical point is reached it is found that the steel has been all converted into martensite, provided sufficient time has been given in heating to permit this reaction to occur completely. The result of this transformation is to break the coarse-grained crystals into a finer-grained or even an amorphous structure.

Such is the treatment required theoretically, but in cast steel there are certain conditions that prevent the reaction from occurring a expected so that it becomes necessary to soak the steel for a long time at temperatures considerably above the upper critical point before obtaining an annealing action. These conditions will be discussed in detail under annealing.

In the case of cast steel which has been quenched (unlike actual practice), we have the usual hardening of steel. Any reheating will result in changes similar to tempering. Hardening and tempering will be discussed in later paragraphs.

Hot-Worked Steel Cooled Slowly

In cast steel it was found that the size of grain structure was dependent on the rate of cooling, but with steel subjected to mechanical treatment such as rolling or forging, we find that the crystalline growth is much slower, if not altogether discontinued, during the time the steel is being so treated. The extent of this retardation of the crystalline growth is controlled by:

1. *The nature of the work being done.* Light hammering, with only a slight reduction in size, may leave the steel almost like cast steel, while pressure under a hydraulic press, combined with a large reduction in area will leave it with a fine-grained or even amorphous structure. The latter is an ideal condition.
2. *The temperature at which work was stopped.* As soon as we discontinue working the steel the growth of size of crystalline grain again commences and continues to the upper critical range.
3. *Rate of cooling from time of completion of work to the upper critical point.* If steel is cooled slowly from the temperature at which work is stopped (especially if this temperature was high) to the upper critical point, the result is a coarse-grained structure of the phases of softened steels. Due to the relatively large grains of pearlite the tensile results, including the elongation, will be found to be low. This is a condition frequently met in the forging of shells where the finishing temperatures are around 1800 deg. fahr. or even higher. In high-carbon heats the forging manufacturers attempt to soften the steel by long-continued cooling, and if this rate of cooling is sufficiently slow we reach the above conditions and find heats failing on yield with an ultimate strength of about 43 tons, where the normal results should be 50 tons and over. To overcome this condition it is necessary to carefully anneal the steel to remove the coarse-grained structure.

Where the mechanical treatment is continued to the upper critical point the structure is fine-grained and is in its ideal condition, but the cost of working steel down to this temperature usually forbids it, so that any crystalline structure that is formed between the finishing temperature and the upper critical point must be removed by reheating (annealing) the steel to the upper critical point and then cooling either slowly or rapidly, depending on the product required.

Annealing of Steel. The purpose of annealing steel is:

1. To increase the softness and ductility of steel in cases where it is too hard for machining;

2. To remove strains and refine grain structure and reduce brittleness or other defects caused by:
   - *a* High finishing temperature while hot-working, leaving a coarse-grained structure
   - *b* Coarse granular structure due to slow cooling as in castings
   - *c* Strains caused by cold-working of steel below critical temperature;
3. To soften steels too hard and brittle as the result of too rapid cooling.

In annealing the operation consists in (1) slowly raising the steel to its upper critical temperature; (2) holding it or soaking it at this temperature for a certain time, depending on size of piece being treated and condition of previous treatment; and (3) cooling from annealing to atmospheric temperature.

Theoretically, as the steel is heated to the lower critical point the usual transformation from the phases of softened steel to austenite is commenced, and continues through the critical range, so that when the upper critical point is reached the steel should be all austenite. As a result of this transformation all pre-existing structures, no matter how coarse, are obliterated and the mass assumes an amorphous structure, providing sufficient time has been taken in heating to permit these changes to occur.

Further, if the temperature is carried above the upper critical point the tendency is for this amorphous structure to again become crystalline. Hence, in annealing steel its temperature should theoretically be raised to the upper critical point only, but practically there are conditions that modify this. For example, in cast steels we find that temperatures considerably higher (as much as 100 deg. cent. above the theoretical temperatures), combined with long soaking, are required to break up the coarse-grained structure. The reason for this is rather obscure. One theory that has been advanced claims that each grain in cast steel is surrounded by a film of sulphides, phosphides and silicides of iron which prevent the crystals from breaking up under ordinary treatment, but with long soaking at high temperatures these impurities tend to migrate to the centre of the grains and leave the surface of the crystals free to break up.

TABLE 2—ANNEALING TEMPERATURES FOR STEEL

Range of Carbon Content	Range of Annealing Temperatures Deg. Cent.	Deg. Fahr.
Less than 0.12 per cent.	875 to 925	1607 to 1697
0.12 to 0.25 per cent.	840 to 870	1544 to 1598
0.30 to 0.49 per cent.	815 to 840	1499 to 1544
0.50 to 1.00 per cent.	790 to 815	1454 to 1499

Mechanical work on steel seems to have the same effect, i. e., it breaks up this intercrystalline film, and as a result we find that the more a piece of steel has been worked the closer the annealing temperatures can be kept to the upper critical point, while the nearer the steel is to the unworked or cast condition the higher the temperatures must be. The ranges of temperatures given in Table 2. have been recommended by the committee on Heat Treatment of the American Society for Testing Materials.

The time of soaking depends largely upon the size of the object being annealed, but sufficient time should be given to permit the object to be heated throughout to the annealing temperature and allow the internal changes to occur. Pieces 12 in. thick require about one hour.

Hot-Worked Steel Cooled Rapidly

The rate of cooling after annealing is controlled by the product required. If a maximum softness and ductility is desired, i. e., for easy machining, we cool as slowly as possible, by either burying the article in a bed of insulating material or allowing it to cool in the furnace. If, however, we wish to retain a certain amount of hardness and strength we must cool faster, as in air or, if a very low-carbon steel, in water, but to do so we must sacrifice a certain amount of ductility and softness. As a general rule, the lower the carbon the more rapid may be the cooling. For example:

- *a* Steels with carbon contents below 0.15 per cent. can be quenched in water and remain ductile and at same time have maximum hardness and strength.
- *b* Steels with carbon contents below 0.20 per cent. can be quenched in oil with results similar to 0.15 per cent. carbon quenched in water.
- *c* Steels with carbon above 0.30 per cent. cannot be cooled so rapidly without destroying the ductility of the steel and so must be either cooled in the furnace, or in the air when extreme softness is not required.

The size of objects must also be considered along with the product desired. Other things being equal, the larger the object the more quickly must it be cooled, so long as the cooling is not too rapid to set up strains.

As an example of the effect of rate of cooling on the strength of steel, we have a system of strengthening steels on high-explosive shells known as the Sandberg air-cooling method. By this method air at pressures ranging from 6 oz. to 15 oz., usually around 10 oz., is either passed around the shell forging or forced to impinge on the revolving shell in such a way that a shell that would normally cool in about thirty minutes or more in the open air, is cooled in six to eight minutes. As a result the ultimate strength is raised from 4,000 to 10,000 lb., with an increase in the elastic ratio but with very little variation in the ductility of the steel. This process is really an intermediate treatment between annealing and the regular hardening of steel, due to the formation of sorbite, which, as explained before, is a transformation phase between martensite and pearlite. Another way to get this sorbitic steel is to first quench steel from the upper critical range, thus retaining its fine-grained structure but leaving the steel very hard and without ductility. The steel is now reheated close to but below the lower critical range, say, from 500 to 650 deg. cent. (932 to 1202 deg. fahr.), when it loses its hardness and becomes ductile. The reason for this is that the steel has been changed from martensite to sorbite. This is really a hardening and tempering treatment, but is referred to here because it is sometimes called a double annealing treatment.

Photomicrographs of Annealed Steel. The photomicrographs reproduced in Figs. 1 to 12 illustrate graphically the distinct change in grain structure caused by annealing to various temperatures. Figs. 1 to 6 apply to one grade of steel, A, and Figs. 7 to 12 to another grade, B. The properties of these steels, after ordinary forging, but before annealing, are given in Table 3.

Hardening of Steel. The most common constituents of hardened steel are martensite and troostite, and as we know the conditions under which they are formed, it is only necessary to treat the steel so as to produce either or both, depending on the hardness required.

To obtain martensite the steel must be raised to the upper critical range so as to transform the pearlite and ferrite, or pearlite and cementite, into austenite. We must not let the temperature rise above the upper critical point, as by so

TABLE 3—ANALYSES AND PROPERTIES OF ANNEALED STEELS, A AND B

Steels	Carbon, per cent.	Manganese, per cent.	Phosphorus, per cent.	Sulphur, per cent.	Stretch at 10 tons	Ultimate breaking load, tons	Elongation, per cent.
A	0.40	0.61	0.062	0.057	0.0	40.3	26.0
B	0.55	0.80	0.058	0.057	0.0	47.9	18.5

HEAT TREATMENT

Figs. 1 and 7: Samples heated to 1500 deg. fahr., held for 2 hr., withdrawn, and cooled in air.

Figs. 2 and 8: After the above heat, samples were heated to 1600 deg. fahr., held for ½ hr., withdrawn, and cooled in air.

Figs. 3 and 9: After the above heats, samples were heated to 1700 deg. fahr., held for ½ hr., withdrawn, and cooled in air.

Figs. 4 and 10: After all the above heats, samples were heated to 1900 deg. fahr., held for ½ hr., withdrawn, and cooled in air.

Figs. 5 and 11: After all the above heats, the samples were heated to 2100 deg., held for 20 min., withdrawn, and cooled in air.

Figs. 6 and 12: After all the above heats, samples were heated to 2275 deg. fahr., held for 20 min., withdrawn, and cooled in air.

In samples A the grain structure increases progressively from the start. In samples B the grain is finest at 1600 deg. fahr., Fig. 8, and increases thereafter. At 1900 deg. fahr., Fig. 10, signs of overheating appear, while samples A show damage only in Fig. 6, at 2275 deg. fahr.

doing we coarsen the structure, and our aim should be to keep this as fine as possible. So we should quench the steel just as it issues from the upper critical range in the quenching medium selected, due to the fact that long exposures to temperatures above the critical point will increase the grain size. However, in deciding on the temperatures to be used we must consider the previous work and treatment given the steel. For example, a piece of cast steel will require considerably higher temperatures for reasons similar to those given under annealing, while steel that has had considerable work done on it (especially when work is continued down to the upper critical range) need only be heated to the upper critical range before quenching. The hardening temperatures in Table 4 are given by E. F. Houghton & Co.

TABLE 4. RELATION OF HARDENING TEMPERATURE TO CARBON CONTENT

Carbon Content	Hardening Temperature to Use	
	Deg. Cent.	Deg. Fahr.
Up to 0.20 per cent.	871 to 899	1600 to 1650
0.20 to 0.35 per cent.	843 to 871	1550 to 1600
0.35 to 0.50 per cent.	815 to 843	1500 to 1550
0.50 to 0.70 per cent.	787 to 815	1450 to 1500
0.70 to 0.90 per cent.	760 to 787	1400 to 1450
0.90 per cent. or over	732 to 760	1350 to 1400

It is difficult in quenching steel to control the percentage of martensite and troostite that will result, or, in other words, to get uniform results from hardening alone, as the various factors that control these percentages as size of piece, rate of cooling, etc., vary so much. So the practice is to endeavor to get the maximum amount of martensite by as rapid a cooling from above critical point as is permissible without unduly setting up cooling strains which might rupture the metal. This leaves the metal too hard and brittle for ordinary requirements, but by tempering we can arrive at any degree of hardness or toughness required.

Steel is most commonly quenched in oil or water. In either case care must be taken, especially with high-carbon steels, to prevent cracking as the result of strains set up by too rapid cooling. If oil or water is used the object should be withdrawn from the bath before its temperature has fallen below 100 deg. cent. (212 deg. fahr.), and the drawing or tempering treatment should follow immediately.

Hot-Worked Steel Reheated (Tempering)

Steel that has been hardened is generally harder and more brittle than is necessary, and in order to bring it to the condition that meets our requirements a treatment called tempering is used. This increases the toughness of the steel, that is, decreases the brittleness at the expense of a slight decrease in hardness.

There are several theories to explain this reaction, but generally it is only necessary to remember that in hardening we quench steel from the austenite phase, and, due to this rapid cooling, the normal change from austenite to the eutectoid composition does not have time to take place, and as a consequence the steel exists in a partially transformed and unstable condition at ordinary atmospheric temperatures. But owing to the strains and rigidity set up by this rapid cooling the steel is unable to change into its more stable phase until these strains are removed by the application of heat. The higher the heat, the greater the transformation into the softer phases. As the transformation takes place, a certain amount of heat of reaction, which under slow cooling would have been released in the critical range, is now released and helps to cause a further reaction, the result of which is that if a piece of steel is heated to a certain temperature and held there, the tempering color, instead of remaining unchanged at this temperature, will advance in the tempering-color scale as it would with increasing temperature. This means that the tempering colors do not absolutely correspond to the temperatures of steels, but the variations are so slight that we can use them in actual practice.

Temperature to Use. As soon as the temperature of the steel reaches 100 deg. cent. (212 deg. fahr.) the transformation begins, increasing in intensity as the temperature is raised, until finally when the lower critical range is reached, the steel has been all changed into the ordinary constituents of unhardened steels.

If a piece of polished steel is heated in an ordinary furnace, a thin film of oxides will form on its surface. The colors of this film change with temperature, and so, in tempering, they are generally used as an indication of the temperature of the steel. The steel should have at least one polished face so that this film of oxides may be seen.

An alternative method to the determination of temper by color is to temper by heating in an oil or salt bath. Oil baths can be used up to temperatures of 500 deg. fahr.; above this, fused-salt baths are required. The article to be tempered is put into the bath, brought up to and held at the required temperature for a certain length of time, and then cooled, either rapidly or slowly. This takes longer than the color method, but with low temperatures the results are more satisfactory, because the temperature of the bath can be controlled with a pyrometer. The tempering temperatures given in Table 5 are taken from a handbook issued by the Midvale Steel Co.

It will be noted that two sets of temperatures are shown, one being specified for a time interval of eight minutes and the other for one hour. For the finest work the longer time is preferable, while for ordinary rough work eight minutes is sufficient, after the steel has reached the specified temperature.

The rate of cooling after tempering seems to be immaterial, and the piece can be cooled at any rate, providing that in large pieces it is sufficiently slow to prevent strains.

How are we to know if we have given a piece of steel the very best possible treatment? The best method is by microscopic examination of polished and etched sections, but this requires a certain expense for laboratory equipment and upkeep, which may prevent an ordinary commercial plant from attempting such a refinement. However, I would certainly recommend any firm that has any large amount of heat treatment to do, to install such an equipment, which can be purchased for from $250 to $500. Its intelligent use will save its cost in a very short time.

TABLE 5. TEMPERING TEMPERATURES FOR STEELS

Temperature for 1 hour		Color	Temperature for 8 min.		Uses
Deg. F.	Deg. C.		Deg. F.	Deg. C.	
370	188	Faint yellow	460	238	Scrapers, brass-turning tools, reamers, taps, milling cutters, saw teeth
390	199	Light straw	510	265	Twist drills, lathe tools, planer tools, finishing tools
410	210	Dark straw	560	293	Stone tools, hammer faces, chisels for hard work, boring cutters
430	221	Brown	610	321	Trephining tools, stamps
450	232	Purple	610	337	Cold chisels for ordinary work, carpenters' tools, picks, cold punches, shear blades, slicing tools, slotter tools.
490	254	Dark blue	710	376	Hot chisels, tools for hot work, springs
510	265	Light blue	660	349	Springs, screw drivers

TABLE 6. RESULTS IN TEMPERING BY AIR BLAST

Percentage Analysis		Before Treatment			After Treatment			
Carbon	Manganese	Stretch at 15 tons, in.	Ult. strength, tons	Elongation, per cent.	Stretch at 15 tons, in.	Ult. strength, tons	Elongation, per cent.	Theoretical ultimate strength, tons
Electric Steel								
0.36	0.57	0.1	37.9	23.0	0.0	40.4	24	36
0.35	0.73	0.2	37.9	27.5	0.0	39.1	26.5	39
Basic Steel								
0.47	0.64	0.1	37.7	27.4	0.0	41.8	25	41
0.52	0.53	0.1	39.5	28.0	0.0	46.6	20.5	42

The other method is by examination of fractures of small test bars. Steel heated to its correct temperature will show the finest possible grain, whereas underheated steel has not had its grain structure refined sufficiently, and so will not be at its best. On the other hand, overheated steel will have a coarser structure, depending on the extent of overheating.

To determine the proper quenching temperature of any particular grade of steel it is only necessary to heat pieces to various temperatures not more than 20 deg. cent. (36 deg. fahr.) apart, quench in water, break them, and examine the fractures. The temperature producing the finest grain should be used for annealing and hardening.

Similarly, to determine tempering temperatures, several pieces should be hardened, then tempered to various degrees, and cooled in air. Samples, say six, reheated to temperatures varying by 100 deg. from 300 deg. cent. to 800 deg. cent. will show a considerable range of properties, and the drawing temperature of the piece giving the desired results can be used.

Precautions to be Used in Heat-Treating. The following precautions should be observed in the heat treatment of steel:

1. Do not put a cold piece of steel into a highly heated furnace. Either reheat it or put it into a cold furnace and allow it to heat up with the furnace. This precaution is especially applicable in cold weather. Also remember that the changes occurring in the critical range are not instantaneous. The steel must be given time to change. It does not pay to rush the heating. Raise the temperature slowly.

2. Allow the piece to soak at the quenching temperature until it is uniformly heated throughout, the length of time depending on the size of the piece and the rate of heating.

3. Do not allow the piece to be directly on the hearth of the furnace, but have it supported at a sufficient height to allow a free circulation of gases on all sides. Long pieces should have sufficient support to prevent sagging.

4. Never allow a piece, especially if it has points or sharp corners, to come in contact with flame.

5. In quenching, immerse the piece with the axis vertical. This will prevent excessive warping or cracks due to unequal contraction in cooling.

6. Care should be taken that no sharp grooves, corners or seams are left on pieces to be quenched, which may develop into cracks.

7. In drawing the temper of a large piece in a furnace never put a piece into a furnace hotter than the drawing temperature nor allow the furnace to exceed the required temperature, otherwise the steel will be softer than required.

8. In drawing large pieces, soak a sufficient time at the desired drawing temperature, to allow the heat to affect the centre of the piece.

9. Annealing and quenching never depend on the eye to judge the temperature; use a pyrometer.

Results Obtained—Sandberg Air-Cooling Treatment

(In an appendix to his manuscript the author gave details of the results obtained in heat-treating cast-steel billets for large shells to meet the specified requirements of 19 tons yield, 35 to 49 tons ultimate breaking load, and 14 per cent. elongation in a 2-in. test piece. For example, a cast-steel blank containing 0.60 per cent. carbon and 0.87 manganese was soaked for four hours at 1575 deg. fahr., allowed to cool in the furnace to 1350 deg. fahr., removed from the furnace and cooled quickly to black in air; then reheated to 1275 deg., soaked for 2½ hours and allowed to cool in the furnace. On test this sample showed over 19 tons yield, 46.2 tons ultimate breaking strength, against 51.2 tons theoretical, and 19.5 per cent. elongation, which indicates very good annealing.

In a second appendix the author gives details of O. F. A. Sandberg's patented method of blowing air upon hot annealed steel for the purpose of increasing its toughness, elastic limit and ultimate strength over that of normal forged steel, the use of which method was allowed free to manufacturers of forgings for the duration of the war. The method is also to be applied to steel rails to improve their wearing qualities. It involves the distribution of air at ½ to 20 lb. pressure over the pieces being treated to rapidly abstract the heat from the steel. The lower the carbon content, the more rapid should be the cooling.

OPENINGS FOR TRADE

The department of Trade and Commerce, Ottawa, have the following inquiries for information regarding Canadian goods. In writing the Department (Commercial Intelligence Branch) use the numbers given with each item.

707. Agricultural Machinery — A party at Cremona, Italy, would represent manufacturers and exporters of agricultural machinery, implements, sundries, etc.

708. Agricultural Machinery, Marine Motors—A party at Bologna, Italy, asks to be put in communication with manufacturers of agricultural machinery and marine motors (for launches).

724. Minerals—An English firm possessing an established connection among buyers would be glad to hear from Canadian producers wishing to secure an export outlet for Cobalt metal, Cobalt oxide, nickel, nickel matte, molybdenum concentrates, ferro-molybdenum, ferro-silicon, ferro-vanadium, vanadic oxide and concentrates, silico-manganese, silico-manganum aluminium, ferro-chrome, and chromite concentrates, including lead ores and concentrates, pig lead, copper, other metalliferous ores, ferro and nonferrous alloys also graphite. Full particulars at the Commercial Intelligence Branch, Department of Trade and Commerce, Ottawa.

725. Iron and Steel—A firm in the north of England, which has been importing steel blooms, billets, slabs, sheet bars, wire rods, etc., would be glad to consider propositions from actual Canadian manufacturers.

726. Electric Motors and Dynamos—A London electrical company wishes to hear from Canadian manufacturers of electric motors and dynamos, both direct and alternating current.

HOW THE RECENT REDUCTION WILL AFFECT SOME OF THE POWER CONSUMERS

BRANTFORD.—That Hydro rates to the consumer will be appreciably lowered in this city was the prediction of Andrew McFarland, chairman of the local board. With the large surplus from last year's operation of the system and with a reduction in the rate charged by the the Ontario Commission a lowering of the rate to householders will be easily made.

WINDSOR.—It is unlikely that any reduction in rates charged to local consumers can be made by either Windsor or Walkerville Hydro-Electric Commission, according to statements made by the managers of the two branches. At present between 4,000 and 4,500 horsepower is being used here at a cost of $38. At the reduced rate to which Windsor will be entitled by the announced cut in provincial rates, the saving is so small that divided among the hundreds of users, the reduction would be negligible.

KITCHENER.—The Hydro rates for consumers in Kitchener will be reduced $1 per horse power as the result of the reductions as announced by the Hydro Commission. The new rail rate will be $19 per horse-power. Reduced rates for the domestic consumers are also expected to be announced in a few days.—Mail & Empire.

CHATHAM.—It is anticipated that the general reduction in Hydro power rates will result in the price of Hydro power being reduced in Chatham about six per cent. from $30.78 to $29 per horse-power, according to an opinion expressed to-day by Manager J. G. Jackson of the local system.

Logical Wish

On the outskirts of Philadelphia is an admirable stock farm. One day last summer some poor children were permitted to go over this farm, and when their inspection was done, to each of them was given a glass of milk. The milk was excellent.

"Well, boys, how did you like it?" the farmer said, when they had drained their glasses.

"Fine," said one little fellow. Then after a pause, he added: "I wisht our milkman kept a cow."

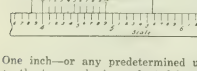
As General Gunn pointed out, the returned soldier has valuable first-aid information, which was intended to assist him in saving life on the battlefield. You can take advantage of this and have your employees who are returned men render good service in this way.

Shop Arithmetic; the Vernier Scale

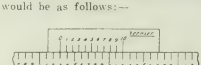
The Fourth of a Series of Practical Mathematics For the Mechanic and Those Learning the Machinists' Trade—The Present Article Takes Up the Subject of the Vernier Scale and Its Use

By J. H. RODGERS

IN our last lesson a brief description was given on the application of the micrometer and its relation to the decimal system of measurement. It was shown how distances, with variations as low as one one-thousandth of an inch, could be accurately determined by scientific means. Modern engineering practice, however, is not satisfied with "near accuracy," as oresent requirements in the finer branches of mechanical science demand still closer measurements than the 1-1000 part of an inch. Many micrometers or measuring instruments are only graduated to read to one-thousandths of an inch, so that when fractional parts of a thousandth are required they cannot be determined accurately on a tool of this kind, unless further facilities are provided. For greater refinement, therefore, it is necessary to provide other, or additional means of subdivision. The recognized method adopted for this purpose is by means of the "Vernier" scale, so called from the name of the inventor. The advantage of this scale is the possibility of obtaining very fine measurements through the slight variations in the graduations of a unit of length on each of two sliding edges or surfaces. These graduations could be made to suit any desired subdivision, but in order to conform to the general practice of the decimal system, and extend its application, tenth divisions are invariably used in standard practice. A sketch will show more clearly the general principle of the Vernier scale.



One inch—or any predetermined unit—on the true scale, is graduated into 10 equal divisions, while the Vernier scale is so graduated that 10 equal divisions will coincide with 9 of the divisions of the true scale. Thus, it will be seen that each subdivision on the Vernier is equal to 9-10 of one of the divisions of the true scale. If the scale in the above sketch was divided into even inches and subdivisions of tenths, the reading would be 4 inches. To obtain a reading of 4 1-10 (4.1) inches the arrow, or the initial line on the Vernier would have to coincide with the first subdivision on the true scale; this would likewise bring the 10 on the Vernier in line with the 5-inch graduation on the scale. For any other even tenth of an inch division the cipher line on the Vernier would be located in line with the division desired. For 2 3-10 (2.3) inches, the setting would be as follows:—

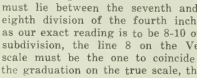


It has been shown that when the initial graduation of the Vernier has been moved to coincide with one of the scale graduations, the setting has varied in tenths of the primary unit. For finer measurements the intermediate divisions on the Vernier are considered. As each division on the Vernier is equal to 9-10 of one of the divisions on the scale, it will be seen that if the graduations 1, in the first sketch, were brought in line, the Vernier would have been advanced 1-10 of one of the scale divisions, or:—

$$\frac{1}{10}\times\frac{1}{10}=\frac{1}{100}=.01 \text{ inch}$$

and the reading would be 4.01 inches.

Suppose we wish to get a dimension of 3.78 inches, what would be the setting on the scale? It is at once seen that the initial graduation on the Vernier must lie between the seventh and the eighth division of the fourth inch, and as our exact reading is to be 8-10 of this subdivision, the line 8 on the Vernier scale must be the one to coincide with the graduation on the true scale, thus:—



It has been explained how fairly accurate readings can be obtained from direct observation by the use of the Vernier scale, as applied to measuring instruments. As mentioned before, however, fine measurements must be derived by scientific means, hence the micrometer and other precision measuring tools.

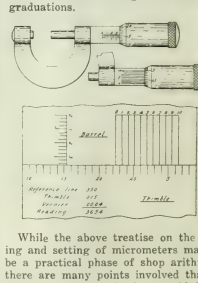
In the preceding lesson it was shown how thousandths of an inch were easily and accurately determined. Further subdivision is obtained by the application of a Vernier scale to those graduations already placed on the micrometer barrel and thimble. The Vernier graduations are located on the barrel of the micrometer parallel to the reference line, but on the opposite side. As before stated, the graduations are so made that the ten Vernier divisions are equal in length to nine of the governing unit—in this case, the graduations on the edge of the tapered portion of the revolving thimble. An example will serve to illustrate the application of the principle. It is required to obtain a reading of:—

$$.3654=\frac{.3654}{.0000}\ \text{inch}$$

Previous instruction showed that graduations on the reference line indicated .1 for each main division, and .025 for each subdivision on the barrel, so that the third main graduation and two of the short ones would show for the dimension here given. The thimble graduation for the above dimension would then be:—

$$.3654-.350=.0154 \text{ or } 15+$$

The + representing the .0004. The setting of the micrometer would be indicated as in the sketch here shown, the reference line to the left, and the Vernier reading to the right (this being on the opposite side of the barrel). To make the application of the circular Vernier more clear, the above setting is developed on an enlarged scale, to illustrate the exact setting of the different graduations.



While the above treatise on the reading and setting of micrometers may not be a practical phase of shop arithmetic, there are many points involved that require a concise and often rapid knowledge of addition and subtraction of decimals to make one efficient in the proper manipulation of these tools. It is, likewise, a demonstration of the everyday use of the decimal system that will lead one to recognize the importance of calculations to the solution of many shop problems.

Percentage

A term with which nearly all of us are more or less familiar, but which few of us could properly define, is that of the word efficiency. Experts are engaged to study the operation of plants, with a view of suggesting or adopting

ways and means to increase the efficiency. A man that cannot meet the requirements of a situation is classed as inefficient; on the other hand, one that fills every requirement is invariably recognized as 100 per cent. efficient. Engines, motors, lathes, and all kinds of machines are frequently stated as being —— per cent. efficient. Without going too far into the technical definition of the term itself, the prefix (per cent.), by which the value of the word is determined, should receive some attention by young students, to enable them to follow this section of mathematics whenever met with.

In some respects it might be said that percentage is another method of calculating by fractions, in which the denominator is understood to be hundredths. The symbol used to express per cent. is (%), as 6%, but in working out a problem the expression is invariably into one or other of the two forms, 6-100 or .06; thus:—

$$6\% \text{ of } 100 = \frac{6}{100} \text{ of } \frac{100}{1} = .6 \text{ or } 100 \times .06 = 6$$

There are five elements upon which percentage are based, namely, base, rate, percentage, amount, difference. The base or principal is the number on which the per cent. is computed, and is equal to 100-100 of its value. The rate is the number of hundredths of the base considered. The percentage is the portion of the base represented by the rate. The amount is the sum total of the base and the percentage. The difference (as the word implies) is the difference between the amount and the base. The rules for calculating the problems in percentage may be expressed as follows:—

Base = Percentage ÷ Rate
Difference ÷ (1 — Rate)
Amount ÷ (1 + Rate)
Rate = Percentage ÷ Base
(Amount ÷ Base) — 1
1 — (Difference ÷ Base)
Percentage = Base × Rate
Amount = Base × (1 + Rate)
Difference = Base × (1 — Rate)

We generally associate the use of percentage to business transactions, such as bank interest, etc., but very frequently we have expressions in the shop, like: five of that batch were rejected as being under size; three out of ten are useless; and similar expressions. The workmen understand such phrases, but when the office records are prepared, it is generally on a basis of percentage that calculations are made. Losses of so much per cent. Men are only — per cent. efficient. If a plant is operating at 65 per cent. of its capacity, and the full output would be 50 lathes per month, what is the reduced capacity? The base in this case is the capacity turnover of 50 lathes, and the percentage of the output would be:—

$$50 \times .65 = 32.50 \text{ lathes}$$

In the operation of a steam engine the brake H.P. is found to be 125, and the indicated H.P. 160; what is the efficiency of the engine, and what percentage is lost in overcoming the friction of the moving parts? The efficiency is the result obtained by dividing the power delivered by the power supplied; therefore, the efficiency in the above case would be:—

$$\frac{125}{160} = .78125 = 78\frac{1}{2}\%$$

and as the loss through friction equals 160 — 125 equals 35 H. P., the percentage of loss would be 35 ÷ 160 equals 21⅞ per cent.

An allowance of 5 per cent. on spoiled work was given to a workman, over which he was to forfeit 80 per cent. of the cost of production. He was paid 3 cents per piece, and after a day's run of 180 pieces it was found that 16 pieces had to be rejected; what was his loss over his regular allowance? His allowance clear would have been 5 per cent. of 180, or:—

$$180 \times .05 = 900 \text{ pieces}$$

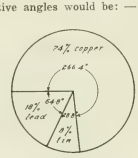
With 16 pieces rejected he would be out 80 per cent. of the cost of 7 pieces, or:—

$$7 \times 3 \times .80 = 16.8 \text{ cents}$$

A bronze mixture is to be made containing 74 per cent. copper, 18 per cent. lead, and 8 per cent. tin. If the total weight is to be 600 lbs., what would be the relative proportions? Illustrate same by circular chart, showing relative size of sectors.

600 × .74 = 444.0 lbs — 444.0 "copper"
600 × .18 = 108.0 lbs — 108.0 "lead"
600 × .08 = 48.0 lbs — 48.0 "tin"
600 - alloy

To construct the chart, draw a circle and find the angle for each sector, the same as above. A complete circle contains 60 degrees, therefore, the respective angles would be: —



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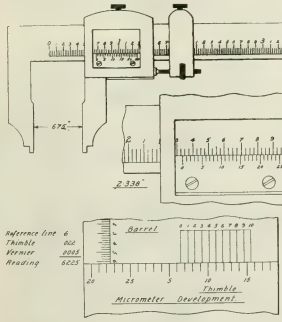


THE VERNIER SCALE

The Vernier caliper here shown is graduated for adjustment in 1/1000 of an inch.

Scale graduated in fortieths or .025—same as the reference line on a micrometer.

Each main division represents 4/40 or .1 of an inch.

Vernier has 25 equal graduations, equal to 24 graduations on the bar scale, giving a variation in width of the respective divisions of 1/25 of 1/40, which equals 1/1000 of an inch.

When the two cipher graduations are in line the faces are together and no reading is obtained.

The reading on the enlargement is 2.325 on the scale, and .013 on the Vernier, the setting being 2.338 inches.

At the lower left is shown a micrometer development, the reading being .6 on the reference line, .022 on the barrel, and .0005 on the Vernier, giving a dimension of .6225 of an inch.

WELDING AND CUTTING

Repairing a Broken Crankshaft by Thermite

An Interesting Repair Job on a 10-in. Upsetting Press Crank Which Had Been Broken Through the Severe Work It Was Called Upon to Do

By W. F. SUTHERLAND

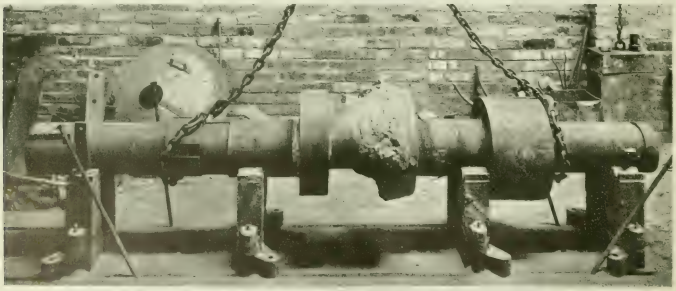
THE accompanying illustrations show an interesting repair job on a 10-in. shaft for an upsetting machine. The shaft had broken off at the web of the crank. The first step in the making of a repair was to burn off or cut away sufficient metal at the break to leave a one-inch clear space. In welding crank shafts it is customary and best to align the shafts on vee blocks These vee blocks, as may be seen from the illustration, are heavy pieces accurately machined and sliding in the machined slot of a heavy bed plate. The vee blocks should be spaced along the bed plate so as to correspond to the journals or bearings of the shaft. Parallel to the main slot of the bed plate and on either side of it are smaller slots similar to those in planer beds. The heads of the holding down bolts are placed in these slots opposite the vee blocks and a short bar or channel placed across the shaft is bolted down, holding the shaft rigidly in alignment.

The vee blocks should be so placed on the main journals that the shaft can slide at least ¼ in. either way, parallel to its axis, without a shoulder or crank throw striking any part of the vee blocks. It is usually desirable to line up the shaft with the throws in a horizontal position.

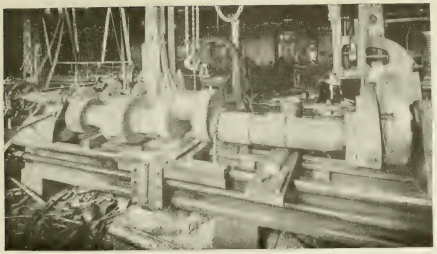
Special types of vee blocks are made which accommodate the expansion and shrinkage movements of the steel shaft and of the web of the crank.

After the correct alignment has been

PRETREATING THE SHAFT.



THE CRANKSHAFT AFTER WELD HAS BEEN MADE AND GATES CUT OFF.



TURNING UP THE CRANKSHAFT.

secured the wax pattern mold is made by melting the wax and building it up in the mold to the shape desired for the weld. The various risers and gates are made in the sand mold by means of wooden patterns.

The molding material used is one part fire clay, one part ground fire brick, and one part fire sand. This is the facing material and the rest of the mold is backed up with a mixture of one-third fire-clay and two-thirds good silica sand.

After the mold is rammed up the wax is burned out and the mold preheated, as shown. In the illustration only one burner is shown, although there are two in operation, the other one being on the other side of the mould. The burners used employ compressed air and burn kerosene.

The automatic crucible containing the thermite charge and of the proper size to hold the right amount is placed over the pouring gate. In particularly large jobs it is sometimes necessary to provide more than one crucible and more than one pouring gate.

The conical steel crucible has a bottom opening with a magnesite thimble closed by a plug with a striker or tapping rod attached. The crucible is lined with a magnesia tar lining. This lining, when necessary to renew it, is made up by putting through a foundry screen and then heated until it becomes plastic. It is then rammed into the opening formed by the shell and a sheet metal cone, is placed inside to act as a form. The lining is then baked in an oven at a red heat.

Fig. 2 shows the shaft after having been welded and the thermite metal is clearly visible, as the rough portion in the centre of the illustration, the gates and risers, have been removed by the oxy-acetylene torch before the picture was taken.

Fig. 3 shows the shaft in its finished form after having been machined. This job of welding was done at the Metal and Thermite Corporation plant, Toronto.

NOT SO LONG AGO

In 1898 gasoline sold for six cents a gallon.

The first New York motor car show was held in 1900.

The first 4-cylinder car was brought out in 1900.

In 1896 Barnum & Bailey announced they would exhibit throughout the country a "horseless vehicle."

In July, 1898, the news was given that a plant would be built to turn out "one motor carriage a week."

It is hard to conceive that in 1896 there were but four motor cars in the United States.

The first long-distance tour was made from Cleveland to New York, It took from July 28 to Aug. 7.

In March, 1897, in the New York Journal, a writer described his first motor car ride as follows:

"In search of a new sensation I went yesterday and rode in a horseless carriage. I dreamed once that I walked down Fifth Avenue in my pyjamas in the full tide of the afternoon promenade and almost died with shame before I awoke. Yesterday I had something of the same strange feeling as I sat there and felt myself pushed forward into the very face of grinning, staring and sometimes jeering New York."—New York Telegram.

BUILDING UP WORN BLOOMING MILL ROLL.

INTERESTING THERMIT WELDS

By C. O. F.

The illustrations show a blooming mill spindle 26 feet long and 22 inches in diameter, being repaired by the Thermit process. This spindle was badly worn, and had been sent to the scrap heap, when it was decided to build up the worn parts by means of welding, and the Thermit method was adopted.

There were in all eight patches to be made, and instead of making these in eight distinct operations it was decided to make one job of it and pour the eight patches at once. To do this a gate was made right round the circumference and one leading in to each patch. A riser was made from each patch, and after careful preheating the job was ready for pouring. This was accomplished successfully, resulting in a large saving of time and money.

It is estimated by the fuel conservation engineer of the United States Fuel Administration that scale in the ordinary boiler causes a waste for every ton of coal burned; for 1-50 in. of 100 lbs., for 1-32 in. of 140 lbs., for 1-25 in. of 180 lbs., for 1-20 in. 200 lbs., for 1-16 in. of 220 lbs., for 1-11 in. of 300 lbs., and for 1-9 in. of 320 lbs. Thus a scale less than ⅛ in. thick causes a loss of 15 per cent. of the fuel burned.

WHAT OUR READERS THINK AND DO

Is There Such a Thing as Easy Money Now?

This article is written by one who has found the way, and is willing to leave the door open for any others who care to come in.

EASY Money? What a lure there is in these two words, and yet we hear the skeptics sneer, "There ain't no such animal." But hang the skeptics. Is there no possibility that these aforementioned growlers may be wrong, and that somewhere there is a lot of easy money laying around to be picked up at very little effort?

To begin with, what is easy money? To the writer's opinion, anything which comes easy, comes without much effort, or in other words, comes entirely outside of one's regular income. Get the idea. Some extra cash we didn't know we could procure. As some people term it, "Velvet Money," or something pretty soft.

But enough of the definition of the luring words, so now let's see how we really can get into this easy money game, for strange to say, "The more the merrier" in this case in point. There is a wide field, in fact a mighty wide field, and no crowds aiming to grab off the spoils, that's the funniest part of it all.

Perhaps the writer had best start off with his personal experience.

About—oh, well, never mind how many years ago, the writer heard there was some easy money to be made in writing for the press, especially the technical press, if one was at all competent to do so. That word COMPETENT stuck me. I could not (in my own mind at least) classify up to that standard, so I sat back sorrowfully for another year or two thinking of all that easy money I had heard of passing me by.

One day a friend of mine (I didn't know how good a friend he was at the time) said to me, "Say, Blank, why don't you get busy and write up some ideas for the magazines I see you reading?" Of course I laughed and said I wished I could. "Why not?" my friend replied. "You've seen some ideas in your time, haven't you?" "Yes, but I can't place them in such form as I'd like." I replied, "in fact I'm no hand at grammar." "Don't let that worry you," was my friend's parting advice, so after his departure I thought the whole thing over and decided to take a chance.

Wow—when I think of that first article, even now I laugh. It sure was rough. Words all twisted, and the sketch I sent sure was dirty, for I was in the machine game at this time and hadn't learned the art of keeping my hands clean. After I had posted it, I got a bad case of cold feet. I fully expected to receive a polite notice from the magazine to whom I had sent the work that from now on, kindly keep my ideas to myself, but imagine my surprise in a space of a little over a week's time to receive a check for $1.00.

Did you ever realize how big a dollar can be under certain conditions? Personally that dollar to me was a gold brick, for it was least expected. To make a long story short, and in order not to tire the reader with the detailed climb up to bigger things, let the writer say briefly that those dollar days are over, and now the road is easy to travel at a bigger rate per article than before. And why?

Simply because he stayed with it. Kept sending his ideas along, finding that editors, instead of being the crabs they are supposed to be, were gentlemen in the true sense of the word, eager to help, encouraging you on to bigger and better things. Advice was sent to me on numerous occasions from editors, without even a request for such being made. "We want articles dealing with die problems," wrote one editor, going into the details of various type of dyes that would especially appeal to him.

Immediately I went through the shop I worked in, snooped around, if I may use that expression, and gathered in ideas, placed them on paper, and later received what I cannot help but term easy money, for it was easy.

Most of my work was done in my spare time in the evenings. As to just how much I made, well, that's a personal matter, not for publication, but enough to say it was sufficient.

But why all this story? I imagine readers ask. Simply because I believe as I said at the start of this article, that there is room for all, from the lowly apprentice in the shop, to the superintendent in the plant, yes, and to the drafting trade in general, even to the plant engineer.

It's not a disgrace to write for the magazine, rather the reverse, but from the hesitating attitude of some members of trained machine forces you would imagine that to be writing for a technical paper was wasting your valuable time.

The writer feels sure that if the editors of the technical press were consulted they would say with energy "Send your stuff along, and we will see that it gets up in proper shape if at all suitable." (Editor's note.—We agree with the foregoing to the limit.) So a word to the reader, get busy, send your work to the various papers, especially CANADIAN MACHINERY, where the writer of this article knows you will get the very best of treatment, and see how much easy money you can make in a year.

But how shall I send it? you ask. For beginners' benefit, let me go through the method of preparing an article for the press, or better still, let us suppose the writer intends sending an article to CANADIAN MACHINERY.

Now first of all, it should be the aim of all readers

eager for this easy money to be readers of the magazines they're interested in, therefore, I take it for granted you all read CANADIAN MACHINERY.

As you are aware there is a section called "What Our Readers Think and Do." Naturally if it's just a little idea you've seen throughout the shop or on your travels, the idea belongs in this section, so let us get to work.

If at all possible make a sketch of the idea, no matter what it is, jig, die, etc., etc. Should a sketch be impossible, then get a photograph, from the best angle to show to the best advantage the particular part you are going to speak about, then write your text, as it called.

First, write up a rough draft of what you intend sending, then polish it up a little before actually sending it on its way. This will not be necessary when you become accustomed to the work, but for the start, is a good idea.

Now enclose your sketch or photograph, together with text matter to the editor, and watch the results. They will surprise you. Should you not hit the bull's eye the first time, try again, for there is easy money in this game, if you've got real ideas to sell.

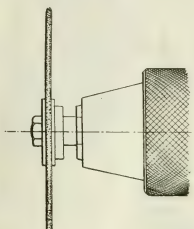
Of course, if the idea is a bigger one, the same course applies, only it means more work preparing the text, sketches, etc., but it means more money in the old sock at the end of the year, so in conclusion let the writer say that there is easy money, and that it's to be found by writing intelligently for the technical press.

No person is barred, and the very ones who least expect that they can win in this game come out on top, so make a stab at it, try your hand at it, for you never know your luck until you try.

SOME of the dealers state that since the closing of the shell shops the sale of 14-inch files has fallen off. Now that the rough spots have been turned off the Huns, there is not the same demand for the equipment.

THE STATIST, a London financial journal, is offering an award of one thousand guineas, or about five thousand two hundred and fifty dollars, for the best scheme for dealing with the Empire's debt created by the war. The scheme must be practical, non-party, informative, and original, governed by economic conditions within the Empire, and give a due regard to our political, economic, and commercial relations with other countries. The basic principles underlying money and trade, and the duty of those who control wealth and encourage production are to be observed, and only those of British or Colonial birth will be permitted to compete.

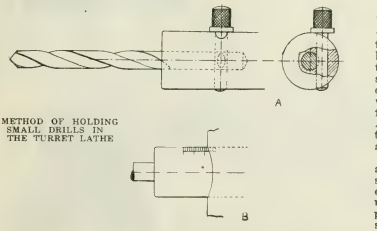
HOLDING SMALL GRINDING WHEEL IN DRILL CHUCK



DRILL CHUCK USED FOR HOLDING GRINDING WHEELS

THIS is a dodge to enable a small wheel, for thinning drill points, sharpening various tools, etc., to be used in the sensitive drill, the occasion being when the regular machine is in use by other men, or it is dismantled temporarily for repairs or cleaning. The wheel is mounted on a plain parallel arbor, as shown, this being gripped in the chuck. Of course in a large shop the need for such a dodge would scarcely be felt, but in a small one with limited equipment conditions are very different.—FRED HORNER.

HOLDING SMALL DRILLS CONVENIENTLY IN THE TURRET LATHE



METHOD OF HOLDING SMALL DRILLS IN THE TURRET LATHE

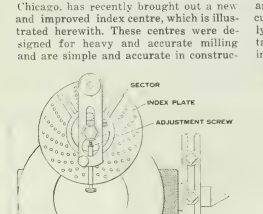
IN cases where it is desired to get holes very closely to size, and a small drill gives trouble from the edges chipping (the material being hard and of irregular quality) it is necessary to have the drill easily removed from the turret socket, so that the point may be touched up as desired, and the drill replaced with the minimum waste of time. A simple dodge which has been found convenient is that seen at A in the figure. A loose peg is dropped into a hole in the socket, the hole being located so that the pin cuts across a shallow groove filed in the drill shank.

The frequent touching up of the point naturally affects the depth of drilling, and the second suggestion, at B, is that of graduations marked on the drill socket, so that the latter may be replaced either exactly at the same amount of projection, or given a slight forward adjustment, so saving altering the turret stop for the purpose. FRED HORNER.

DEVELOPMENTS IN SHOP EQUIPMENT

10-INCH UNIVERSAL INDEX CENTRES

Fred C. Dickow, S. Desplaines St., Chicago, has recently brought out a new and improved index centre, which is illustrated herewith. These centres were designed for heavy and accurate milling and are simple and accurate in construction and positive docking device which cannot force the spindle out of line. This locking device relieves the form, worm gear, and index pin from all strain during the cutting operation. The spindle can easily be adjusted and has a B & S No. 10 taper hole through spindle, the nose being threaded for a chuck.



DETAILS OF CONSTRUCTION

the accuracy of this centre are of interest.

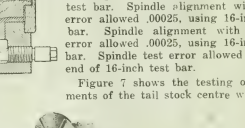
Figure 4 shows the method used in testing the accuracy of the worm gear in every tooth. The perfect square is mounted to the spindle, and through proper manipulation of square and test indicator a very accurate test of every tooth is made, and the accumulative error reading .0001. The accumulative error allowed in spacing of the entire circumference of the worm gear is .0005; the average is .00025.

Figure 5 shows the testing of tail stock centre parallel alignment with sides of tail stock block, the error, which is the error allowed, .0002.

Figure 6 shows testing of spindle alignment with base spindle alignment with T slot; also testing how much spindle runs out at end of 16-inch test bar. Spindle alignment with base error allowed .00025, using 16-inch test bar. Spindle alignment with T slot error allowed .00025, using 16-inch test bar. Spindle test error allowed .0005 at end of 16-inch test bar.

Figure 7 shows the testing of alignments of the tail stock centre with head

DETAIL OF TAILSTOCK



INDEX CENTRE COMPLETE

tion. The capacity is such that they will swing a piece 10 in. in diameter. The worm gear is 5 in. in diameter and is located centrally inside of the swivel block between the large front and rear spindle bearings. The worm is in one piece and runs in a long bearing; end wear can be taken up by adjusting the end thrust nut. The wear between the worm and worm gear is then taken up by four screws, at the top of the worm case.

The swivel block which carries the spindle is graduated and can be set any angle from 10 degrees below the horizontal to 10 degrees beyond the perpendicular, and is held firmly at any angle by two rigid and durable clamps.

The spindle is provided with a simple

The tail stock centre can be raised vertically and set at any angle in a vertical plane by loosening clamp, and lever bolts. The block, body insides and bottom are scraped to surface plates and perfectly fitted. The body is provided with taper lock pin to lock block to body. This prevents the block from moving in the body under a heavy cutting operation.

Three index plates are furnished dividing all numbers to 50 and even numbers to 100 excepting 96-T. The index chart furnished gives all divisions obtainable to 380.

The testing of index centres is an important part of their manufacture and a number of the tests used to determine

centre, using 12-inch test bar. Error allowed, .0005.

Figure 8 shows the testing of spindle

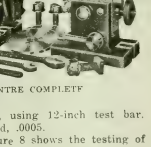


FIG. 4

FIG. 5

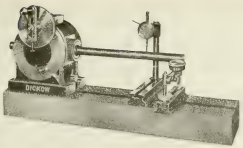


FIG. 6

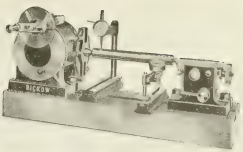


FIG. 7

FIG. 8

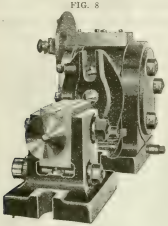


FIG. 9

parallel alignment with back of swivel block, using test bar 24 inches long. Error allowed is .00075 in 24 inches.

Figure 9 shows the side and back view of dividing head and tail stock.

PRODUCTION SPOTFACERS

A cutter designed primarily for production spotfacing is illustrated herewith. It is made with two lips instead of four or six, which obviates the heavy breakage experienced with other types. These cutters are made of high speed steel, properly hardened and ground and manufactured in all sizes from ⅝ in. to 3 in. Pilots are standard in 64th in. sizes and holders are provided with either straight or Morse taper shanks. All parts are interchangeable. These spotfacers are especially adapted for machining irregular or sandy castings as teeth of cutter do not drag but remove scale in one revolution. Ease of grinding and long life are additional features of this Spotfacer which is made by the Production Tool Co. of America, Detroit, Mich.

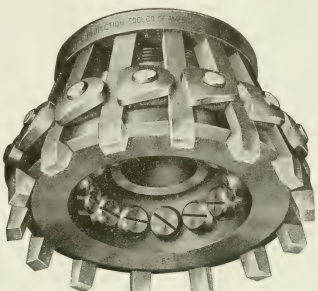
"PRODUCTION" SURFACE MILLING CUTTERS

A Surface Milling Cutter designed to stand heavy feeds of high duty milling machines and to produce a finished surface with one cut has been designed by the Production Tool Company of America, Detroit, Mich.

Its free-cutting qualities and firmness of clamping methods enables the tool to give the same results on solid steel pads and thin or chilled castings.

Standard square bits of high speed steel are used and provision is made to allow for repeated adjustment for a new series of grinding before bits are finally short enough to be used on lathe or shaper tools.

Low first cost and long life are additional claims for this type of cutter. The construction of this cutter may be seen from the accompanying illustration.



GENERAL VIEW OF THE CUTTER

GENERAL VIEW OF THE TOOL

To Help Export.—A new procedure has been adopted to facilitate export from Canada to Denmark, Norway, Sweden, Holland and Finland. The Canadian Trade Commission can now approve licenses for rationed commodities direct without waiting for approval from London. This will relieve the telegraphic congestion which has been so troublesome of late.

New Board of Trade.—An organization has been formed and arrangements completed by the wholesale merchandise brokers of Montreal for the furthering of the interests of the brokerage business. It will be known as the Wholesale Merchandise Brokers' Association and will be incorporated as a branch of the Board of Trade. It is expected that every important broker of the city will become a member of the association.

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Conditions in Europe

A WELL-KNOWN Canadian who has has been in the Old Country for some time on legal business, and who was formerly in the Parliament of Canada, had an interesting conversation with a representative of CANADIAN MACHINERY.

He had a good deal to say regarding conditions in Great Britain and Europe of interest to Canadian business men. He claims that there is a good deal of misunderstanding existing in Canada as to the real conditions in Europe. He could find no sign of food scarcity, for example, either in Paris or in the country districts in the parts of France he visited, and the same is true of Belgium. "The people of Paris say," said he, "and this was confirmed by American officers who had been in Germany, that there is no sign of food scarcity along the Rhine, at least. One American officer with whom I conversed, quoted what had been said to him by the widow of a German officer, at whose house he was billeted. In speaking of the sending of food supplies from the United States, she said: 'All we really need is a little soda and pepper.'

"French and Belgians are all at work on reconstruction, and hustling to set their countries to rights again. In Great Britain there is a fine spirit evident. The business men and the working men are going to work to effect reconstruction, instead of sitting down and talking about it, as we seem to be doing in Canada; and I saw no such spirit of expecting a time of waiting and prolongation of the war time sentiment of hopelessness as there has been in Canada.

"The tenure of office of the Lloyd George Government seems somewhat insecure. It is confidently anticipated that peace will be signed this month. The future of the present Government in Great Britain depends largely on the personal energies of Lloyd George. It seems questionable whether internal troubles will not result in an early defeat of Union Government in Great Britain. The lack of strength due to the conflict of party ties, and the fact that the Government is disposed to yield to popular clamor from day to day, is having its effect on public sentiment.

"There should be no trouble in our doing a large trade with Europe, even without Government assistance, but for the fact that Canada was the only country in the world which found itself, at the conclusion of the war, without transportation facilities by sea. Early in the war, Australia purchased forty large freighters, which earned large profits for her while hostilities were on, and are available to-day to carry the products of that country abroad wherever they are required. The United States, too, is reaping the reward of the shipbuilding policy which she pursued during the past two years, and for this reason is in the position of being able to compete with Great Britain.

"It was a fatal mistake for Canada to have allowed the Imperial Munitions Board to build ships here which went into the hands of shipowners in Great Britain. In 1916-17 I urged on the Government the necessity of embarking on a shipbuilding programme, but nothing was done until 1918. Consequently, we are now dependent for transportation on such shipping as we may get from other nations, and for which we have to pay rates which are almost prohibitive. If we had the shipping in our own hands, our manufacturers might be in the European market to-day with sale for our surplus products.

"Mr. Lloyd Harris and his commission have been doing good work in Europe. He has pressed upon the British Government the removal of discrimination against Canada in the matter of exports from this country, is showing great energy in all respects, and is trying to induce the people of Great Britain to divert their attention from their own problems to those of Canada."

Should Develop Canada

AN interesting idea has come out of the West regarding the natural resources of Canada, and what might be called a national policy of development. Prof. R. D. McLaurin, of the University of Saskatchewan, was in Ottawa recently, trying to forward the idea with the Government, and the Western members, who have formed a Committee of Natural Resources, have the matter before them.

They urge the Government to undertake a constructive policy looking to the development of the natural resources of Canada, particularly oil, iron and coal. Prof. McLaurin makes a rather interesting suggestion for solving the tariff hostility of the two sections of the country and bringing the East and West together. He argues that by developing the mineral resources of the West, and thus supplying materials for creating industrial communities there, we should develop basic national industries which every Canadian, even the grain grower, should be willing to see protected if necessary. "It is a different proposition," says Prof. McLaurin, "to protect industries necessary to the peace and security of a nation, from protecting a manufacturer who imports his raw materials from foreign countries and sells merely the finished product. By the latter method, economic independence for Canada is impossible. We should produce our own raw materials for the educational and economic benefit of our people. A nominal political independence is of less value to Canadians, when we are dependent on the United States for basic materials."

It is pointed out that the Government at Washington is co-operating in a most effective manner with the coal, oil, and steel industries of the United States, and if our own Government fails to inaugurate a policy which will serve Canadian and British capital to develop and control resources within the Empire, we can rest assured that Washington will not be asleep at the switch.

Canada now imports 95 per cent. of her iron ore; 98 per cent. of her crude oil; 50 per cent. of her coal, and large quantities of other raw materials, which are available here. A more energetic policy of survey, exploration, and propaganda in connection with the development of our resources, particularly in the Northern and Western areas, would seem to be desirable.

IT IS claimed that flying has been brought to a high state of perfection, in fact, that it can be commercialized. But flyers have waited for ten days or so to get good enough weather to cross the Atlantic. Imagine putting on your Sunday suit, packing your tooth brush and nightie in a carpet bag and then waiting ten days for the weather man to put on the O.K. signal!

A Standard System of Dimensioning Drawings?

An Article, Wherein Starts a Wail of Woe Based Upon the Fact That a Search Has Been Made For a Standard System of Dimensioning Drawings, But Without Success

By I. M. CURIOUS

I SHOULD have been content in the first place to let well enough alone, but still it is too late now to turn back. My name is even against me, for it sours me on from investigation with the undying flame of my curiosity ever burning, sometimes a little low perhaps, but nevertheless burning. True, at times the answers I have received have been somewhat discouraging, still I keep on trying to find the ideal standard system for the dimensioning of drawings because even although I am discouraged still I do believe that somewhere at some time I may find out where the confusion started. So now that the idea of my search is out, you can readily see why this article was written. I am out for information, so readers lend me your ears, and answer (not all at once, please). "Is there a standard system of dimensioning drawings?" If there is such a curio where is it to be found? If there is not, why not?. Is there a law against such a thing?

To get right down to brass tacks, and speaking with all seriousness, why in the name of Allah will one drawing office persist in calling every dimension over 12 in. by the name of feet and inches, for instance 14 inches would be specified 1 foot 2 inches, while in another drawing office the same figure would be meekly called 14 inches? Then again we will suppose we are still in drawing office No. 2; here they are content to keep to inches up to 24. Anything above that reverts to feet and inches, as for instance 29 inches equals 2 feet 5 inches in this room.

But wait, here we have a drawing office No. 3 which believes that all dimensions under 36 inches should be simply termed inches, but that above this figure away we go once more to feet and inches. Last, but not least, we enter drawing office No. 4. Here we find a deep disapproval of the terms feet and inches. Stick to the word inches is the chief slogan here, no matter how high, the sky is the limit, so round we go, merrily finding champions of each of the systems spoken of.

So now, since the systems have been mentioned, let us see what the humble author found on his tours of earnest and annoying questioning.

"What's the bright idea of calling for feet and inches over the 12 in. mark?" I queried of chief draftsman No. 1.

"Simply because it aids accuracy," was th confident reply. "A 12 in. scale is almost sure to be made of steel, which is a distinct improvement over the two or three-foot wood rule, so, concluded my victim, I always call for feet and inches over the 12 in. mark."

"But," I suggested humbly, "there are some pretty fine 2 ft. steel scales on the market." "Not many," was the brisk reply, so, leaving him with the feeling that he must be correct, I passed on to chief No. 2.

"That is quite a system you have of dimensioning anything over 24 inches by feet and inches," I opened up, and so did the chief. "You bet," he replied. "You see," he continued, some people have an idea that anything over 12 inches should be called feet and inches, but don't you believe them for the 2 ft. rule is the handiest rule of all, and they are more used than any other kind." "But isn't the 12 in. steel scale more accurate?" I chimed in. "Now who told you that" was the reply. "Why there are 2 ft. rules on the market just as accurate as ever the 12 in. ones were ever made; why, even the wood rules are down to the fine point now-a-days. Believe me, pal when I say that if you ask the man in the shop he will shout out 'The 2 ft. rule for me.'" So, agreeing he must be correct in his views I moved on to chief No. 3.

"Why is it," I started boldly, "that you do not mention feet and inches before the 36 in. mark is reached?" He gave me a look of pity. "Don't you know that the workman in the shop would rather work to that system?" he asked me. "No," I replied meekly, "I imagined he would rather work to the 12 in. size, or perhaps the 24 in. or 2 ft. size," I finished lamely for his eagle eye was on me.

"So you've heard all that bunk about the accuracy of the 12 in. scale," he shouted at me, "and how handy it is to carry a 2 ft. rule around and so on and so on, well, let me tell you," he said confidently, "that if you take the trouble to enquire you will find that the average workman swears by the 3 ft. rule every time. It is accurate and handy. Why, he would rather use that size than any other." "Yes," I replied brokenly, and made my hurried departure to chief No. 4.

"Please sir," I said, "for he was a big guy, "why is it that you refuse to use the term feet and inches" This chief was a good sort for he laughed out loud. "Don't you know that a workman hates to see the term feet and inches on a drawing?" he asked me between the laughs. I shook my head in the negative, for I was sort of dazed at this turn of events. "You go out and ask the workmen on the subject," this chief kindly suggested, so thanking him I bowed myself out of his presence, believing such a fellow as this who could afford to laugh about it must be right.

So after a few days, in which I worked up further courage, I went into the shop and tackled foreman No. 1. After chatting pleasantly on the lovely weather, etc., I suddenly noticed as if for the first time, a drawing, and peering at it said wonderingly, "Why, everything above 12 inches is marked in feet and inches." "Yep, ain't it a deuce of an idea; why can't they make it feet and inches over the 24 in. mark so that we can use our 2 ft. rules?" This from the foreman of the shop where chief No. 1 was consulted and who absolutely was convinced that the 12 in. idea was the only one. "Why not tell the chief draughtsman about it?" I suggested. "Tell him—say, I've talked till I've needed throat tablets, but he's a bug on the 12 in. idea, so there you are." Yes, there I was all right, stuck once more, so I got out before I collapsed.

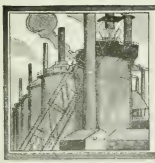
Off to No. 2 shop I went and started the same old story, but with what a result. "So you've noticed that the dimensions are marked feet and inches after the 24 in. mark? Wouldn't it make you tired? There is only one real method, that is over the 36 in. mark call them feet and inches, but before that, nothing doing." "Did you ever mention your views to the chief draftsman," I enquired in a humble tone of voice. "Sure I did, but what good did it do, his ideas and mine never did mix."

I had my hat in my hand by this time and bid my host No. 2 adieu, making a bee line for foreman No. 3.

It was easy to open up the subject at this point for the foreman was full of it. "Of all the darn fool ideas," he started,"to have all the dimensions marked in inches up to 36, then to call the rest feet and inches." "What would you suggest?" I asked enquiringly. "Carry the inch idea throughout, don't mention feet and inches at all," he replied. "A scheme such as this saves time in the long run, but there is no use in talking, our chief draftsman here can't see it that way, so there you are," Yes, I was there again all right, so I wished him good day, and started for the last, but not the least, foreman No. 4.

"I understand you use the straight inch dimension idea here." I opened up fire with. "So the bad news has travelled to you?" says foreman No.4. "Isn't it a shame to wish a system like that on us? Do you see that man down there bent over his bench?" I looked in the direction the foreman pointed and admitted that I did, also that he appeared to be very busy. "I agree with you," said the foreman with a sneer. "No wonder he looks busy for he is trying to find out how many feet and inches there are in 197 inches." "What principle do you favor?" I asked, with fgear in my voice, "There is only one real idea," was the reply, and that's the 12 in. one.

(Continued on page 416)



MARKET DEVELOPMENTS

Price Fixing Having a Hard Time Trying to Live

U.S. Naval Department Refuses to Consider Bids on 20,000 Tons of Steel Because the Prices Were all the Same—Machinery Dealers State That the Volume of Business They are Doing is Satisfactory

THE business of price-fixing is having a hard time of it. In fact, there are not a few who would be willing to make the guess that its days are numbered. There is a growing feeling that Director-General Hines of the U.S. Railroad Board was right in refusing to come into the market for steel and recognize the price-fixing programme. He has now secured very good backing from the Navy Department, which in the past few days opened tenders that came in response to specifications sent out. When the figures from the various firms were looked over it was found that they all agreed, being based, of course, on the schedule of fixed prices. The Navy Department returned the bids on the ground that the law required in such cases that there should be competitive bidding. Many of the reports have been colored on the point to show that the Railroad Administration was wrong in refusing to recognize the prices, but there is a growing feeling that the Railroad Administration is right. Whether the present muddled situation will hasten the return of the open market is problematical, but it is sure to come, and it is being demonstrated all over that the fixed price idea is not popular.

Machinery dealers in this district are doing a fair volume of business. There are several large concerns that have mapped out before them their programme of manufacturing, and they are now in the market in a substantial way buying equipment. Large outlays are made on this, and it will be some months of costly preparation during a period of high costs before they can hope to secure any return at all on their money. The motor car industry is responsible for considerable buying, while the National Railways continue to send out a nice line of specifications.

Some dealers are wondering just what to do with the stock of war supplies they have on hand, such as hobs and chasers, two small tools that were used exclusively on shells, and for which no commercial use has since been found. These run into a lot of money, being almost entirely of high speed steel. Scrap prices at so much per pound is their present value. No provision is made by the Government to share the loss the dealers will suffer, although they stocked in order that shell shops might have a quick place to secure needed material.

LABOR TROUBLE IS HOLDING UP BIG BUSINESS IN MONTREAL NOW

Special to CANADIAN MACHINERY

MONTREAL, April 24.—With the opening of the port, Montreal has taken on the appearance of greater activity, and trading circles generally are showing increased optimism on the future outlook. The third of the Government fleet of steamers was launched from the yards of the Canadian Vickers, Limited, last Saturday afternoon. The Hon. C. C. Ballantyne stated that every effort would be made to stimulate this shipbuilding branch of Canadian industry, and expressed the hope that present activity would be continued for some years to come. The harbor is now a busy spot after the quiet winter months, and a few weeks will see a return of pre-war enterprise, to which will be added many new activities in the way of additional trading with world markets. Business developments show no new features, but trading is far from dull. The labor situation is still unsettled, and with strikes now on and others pending, with the granting of increased wages, it would appear that readjustment is still a problem of vital importance. Definite reconstruction plans are virtually impossible under the existing atmosphere of general unsettlement. The iron and steel market here is apparently unaffected by American conditions, as the tone is increasingly encouraging, but there is undoubtedly an underlying influence that prevents a reopening of general domestic enterprise, and this condition will likely continue for some little time yet. Little active interest is displayed in metals, and dealers report a quiet market with a light, but steady demand. A slight falling off is noted in machine tool trading, particularly in second-hand equipment. Old material trading is quiet, as the market is a speculative one under the present uncertain conditions.

Business Improves Slowly

The hope expressed by many, that some basis of price adjustment would be established, so that domestic consumers of steel could get back into harness and commence some program of reconstruction, appears to be almost as remote as in the days immediately following the signing of the armistice. With the heads of the industry and the Government still in debate on this question, the trade is still patiently, or impatiently, awaiting decisive action, of the time when the market will become an oper one, a goal to which present operations are heading. It would seem that some anticipate a return to pre-war conditions, should a competitive market result, but saner minds cannot see where such is possible under the present high state of wages that prevail in most industries, and the strikes that are pending for further advances. The logical plan would appear to be for the trade to recognize the true nature of the situation and start on a reconstruction program at once, leaving some of the issues of readjustment to some future date, when the time is more opportune to lower the level of present costs of manufacture. Local activity is steadily improving, but not rapidly.

Warehouse supplies are increasing as dealers are adding to their stocks. Few price changes are noted and quotations are relatively firm.

Quieter Tone in Tools

Machine tool dealers here, while reporting a fair volume of business, are, nevertheless, anxiously awaiting the outcome of present negotiations in the States regarding a satisfactory arrangement for the disposal of Government-owned machinery. This situation, at present, has no direct bearing on Canadian conditions, but the fact that many old shell plants that had received contracts from the U. S. Government, are well stocked with machine tools, much of which is still in the original shipping crates, has had an unseen influence in the activity of this branch of industry. Many purchasers of machinery are under the impression that this equipment may be sold at a sacrifice, and may be waiting for the opportunity to grab some of it when the same is offered for sale. The method of disposal has not been definitely decided, as manufacturers are holding out for a better selling commission than that proposed by the Government authorities. Sales of used machines are not as plentiful, but a fair business is still reported and dealers are apparently content with existing demand, believing that the future has better in store. Hopes of a radical drop in prices are not entertained by many, as conditions are not conducive to much lower prices.

Dullness in Scrap

Lack of interest appears to dominate the scrap market, as dealers are reluctant to predict the possibilities of the near future. The situation here is more or less influenced by trade developments, and with these of an uncertain character, the dormant nature of scrap is a natural consequence. Price changes effective this week are on medium brass and stove plate, the former quoted at 7 cents per lb. and the latter reduced to $12 per ton.

WELL PLEASED WITH VOLUME OF BUSINESS

TORONTO.—There is more business going on in machine tool circles than may be popularly imagined. Dealers state that they have no complaints to make regarding the volume of trade that is moving. In fact they are ready to admit, even when things are not moving any too fast that their business is much better than they ever thought possible at the time when the signing of the armistice took place. They were ready to state at that time that things would be dull for a few months. In fact they were quite ready to anticipate that the first four months of 1919 would be poor and lean, and in this way they have been disappointed. Transportation has been all to the good for one thing, and movement of shipments is accomplished in a fraction of the time that was taken up for the same period in 1918.

POINTS IN WEEK'S MARKETING NOTES

There is quite large buying being done in Toronto by several concerns which have definite manufacturing lines laid out before them.

—

Dealers report noticing a dropping off in the sale of the larger sized files, for which there was a keen demand during the war.

—

The discounts on cold-rolled shafting at Toronto warehouse are now list plus 25, and at mills list plus 5.

—

Sheets came down $5 a ton. This means that the whole $7 cut made in U.S. prices is not passed on to the Canadian consumer. Dealers claim they cannot make a fair profit under the present rate of 6c for No. 28 black.

—

U. S. Navy Department refuses to buy under the fixed prices for steel. They opened bids recently for 20,000 tons of steel, and finding all the bids the same returned the lot as they claimed it to be illegal.

—

There is a growing feeling that the fixing of prices is not going to remain very long. An open market is much preferred by many of the large buyers, and its return would cause no surprise.

—

Lack of orders, rather than high production costs, seems to be the chief concern of many of the steel mills.

—

There is some dissatisfaction yet in regard to the manner in which the U. S. Government is going to dispose of the machine tools that were used in war work. Some of this equipment is at present in Canadian shops.

Adjusting Sheet Prices

Sheets were moved down about 25 cents per hundred this week. That makes a reduction of $5 per ton, and is $2 short of the cut recently made in the United States. This refers, of course, to warehouse prices here. The warehouse interests claim that they are quite justified in not passing on the full $7 per ton cut, as they have only a fair margin now in which to clear themselves on sheets.

The Canadian trade watches closely what is going on in United States in regard to the attitude of the railroads there. At present no selling is being done to the roads. The trade does not believe that an open market would serve to bring prices much lower, as present quotations, it is claimed, are about as near to the mark as can be expected. The intention of the U.S. Government, in allowing price fixing for steel, was no doubt to provide a safe stepping-stone by which the industry could come down from war-inflated prices to peace-time values, without endangering the stability of the whole industry. The feeling seems to grow that it will all be settled sooner or later behind closed doors, and that there will not be much of a fight in the open on this ground. The railroads, it is stated, are in such shape that they cannot stay out of the market indefinitely. The longer they defer purchses the more they will have to purchase. This line of argument, of course is intended by those who advance it to support the theory that the whip hand in the situation is in reality held by the mills, and not by the railroads.

Good Orders Come In

But apart from all this, the fact remains that there is a big volume of business going through the warehouses, and the indications point to buying being well sustained in future. Some of the paper mills and saw mills are buying to a considerable extent, the former taking a large number of steel forgings, such as grinder shafts, etc.

There is also a good volume of marine business moving and some of the shops capable of handling big business are sending out enquiries for big lots of boiler tubes. This leads to the belief that new contracts are placed, or about to be placed. One story is that the French Government is again in the market for a number of small wooden ships.

Machine Tool Business

Dealers are selling more machine tools at the new price than was thought possible a few weeks ago. Totals of business done this year in many cases compares very favorably with that for the same period last year. The only difference is that this year much of the business, as far as the dealers are concerned, consists of the handling of materials turned over by the Imperial Munitions Board, and resold. It is a fact, though, that there are sales being made in greater volume of new tools. Willys-Overland and the National Railway have been in the market in a fairly large way. Other concerns in this district are in the market for big purchases, and although they have not placed their business yet they have it pretty will lined up. Advertisers probably do not realize all the time the extent to which firms wanting new equipment watch the advertising pages of the mechanical papers.

—

Cleveland, O.—After the meeting of the Lake Carriers' Association here recently, it was announced that a voluntary offer of reduced rates would be made to the Government. It was thought that this would stimulate shipping. The rates on coal, ore and grain will drop in proportion to the lowered rate on steel shipments. The wage scale in force at the close of last season was adopted for the beginning of this season. The line will be known as Houston Lines, Canadian South American Service.

DISPOSING OF WAR MACHINE TOOLS IS NOT AN EASY MATTER TO HANDLE

Special to CANADIAN MACHINERY

NEW YORK, April 24.—The machine-tool situation remains practically unchanged, there being a fair number of inquiries but relatively little buying, and sellers generally attribute the lack of business to the expectations of prospective buyers that prices will soon be further reduced. Manufacturers of engine lathes have made a downward revision of from 10 to 20 per cent. and a well-known milling machine has also been reduced, but many machine tool builders continue to assert that they will make no reductions at present and probably none before July 1 at the earliest.

A deadlock has occurred in the negotiations between the machine-tool trade and the War Department over the methods of disposing of Government-owned tools, both new and used. The Government plan meets with approval in most particulars except as to compensation. All new tools, according to the plan proposed are to be taken back by the companies which produced them and re-sold at present market prices, with a commission of 7½ per cent. to the manufacturer. To this plan the machine-tool manufacturers have dissented because they maintain that 7½ per cent. is not a sufficient commission to cover expenses of handling and to pay commissions to their recognized distributors in various territories, whose commissions as fixed in their contracts are 10 per cent. or more. Even on the re-sale of these tools it is presumed that many dealers would insist on their full commission.

The question of compensation is also the chief point on which the machine tool dealers and the Government fail to agree. The Government plan was to have dealers appointed in all important manufacturing districts to handle sales of the second-hand tools from war plants, and a 7½ per cent. commission was also offered to the dealers. However, through their organization the National Machinery and Supply Dealers' Association have offered a counter proposal, which in brief is as follows: One dealer shall be appointed in each of 12 districts and this dealer alone shall be responsible to the Government for the sale of all Government-owned tools in his district. His commission shall be 2½ per cent. on the gross sales. He shall have the power to arrange with other dealers in his district for the sale of those makes of tools which each dealer handles. The commission proposed for these sales is 12½ per cent. Thus, the Government would be obliged to pay 15 per cent. commission on the sales of all used tools and is asked also to furnish warehouse space without cost for storage of the tools until they are sold.

The office of the director of sales of the War Department has so far refused to accept the plan proposed by the machine tool dealers, while the dealers state that they will not have anything to do with the distribution of the Government-owned tools on any other basis. They argue that it would not be good business for them to market many millions of dollars' worth of Government tools at a lower profit than they can make on their regular lines. The Government officials have used the argument of patriotism, but in the opinion of many in the trade this argument is uncalled for. It is pointed out that the machine-tool trade was working 100 per cent. for the Government during the war, that it took full share of Liberty bonds, and in every way supported the Government in the prosecution of the war, and that now it should not be asked to sacrifice profits from its business to help the Government, which is fully able to pay its way.

Just what the outcome of the difference will be does not appear just at present, but it is presumed that the War Department will eventually be obliged to meet the terms which the machine-tool trade proposes.

Many of the tools which the Government must dispose of are in Canada, several shell plants having been equipped at the expense of the Government not long before the war came to an end.

Meanwhile the Government has not completed its inventory of the tools it will offer for sale, but it is probable that the total will be somewhere between $30,000,000 and $50,000,000. Many prospective buyers are known to be holding off awaiting the disposition of these tools, hoping to pick up "bargains." It will be the aim of the Government, however, to dispose of the tools with as little disturbance to regular trade as possible. The new tools will be sold at the same prices which the manufacturers are now asking for tools shipped from their plants, while the used tools will be appraised at prices based on present prices of new tools.

Aside from this controversy there is little of interest developing in the machine-tool trade. Only one inquiry of importance is before the trade, that being from the Studebaker Corporation, South Bend, Ind., which wants about 90 tools. This business will go to Chicago and Cleveland sellers. Export trade is quiescent and will probably remain so until after the peace treaty is signed.

BUSINESS AT U. S. STEEL MILLS IS ALL FOR PROMPT SHIPMENT

Special to CANADIAN MACHINERY

PITTSBURGH, Pa., April 24.—The pig iron and steel markets have shown no improvement in the past week, but rather have grown quieter. There is universal complaint among steel producers as to the small amount of business they are receiving, their reference to market conditions suggesting the notion that they are booking practically no business at all. Cross questioning, however, develops the fact that they really are booking a moderate amount of business every day, the objectionable feature being that it is all for immediate shipment, evidencing no confidence in the future prices on the part of buyers, while the volume of business is quite insufficient to support present mill operations, which are predicated to a considerable extent upon old orders. While mills operated at an average of 77 per cent. during March they are operating only between 65 and 70 per cent. at present, and half or nearly half the production is against old orders.

In pig iron business is even lighter than in finished steel, but there is no complaint on the part of the merchant furnacemen. They recognize that conditions are not propitious, and are quite content to let matters work out. They have had very high costs, and costs are still quite high, and the merchant furnacemen recognize that the only way to get costs down is to have a period of relative idleness. An open market, which the steel producers seem to fear, has no terrors for the merchant furnacemen, since until the Government took control by reason of the war, pig iron always had an open market. The furnaces made money in one or two years out of three, and they are content to take an off period now.

Feeling Regarding Industrial Board

About few things is a wider difference of opinion expressed than about the operations, or perhaps failure to operate would be a better expression, of the Industrial Board at Washington. It will be recalled that the original program announced by Secretary of Commerce Redfield was that the industrial board would be set up for the purpose of restoring the play of the law of supply and demand, inflating prices, bringing buyer and seller together and starting business on the move. As to restoring the play of the law of supply and demand, what the board did was to set prices for the remainder of the year. As to deflating prices, it brought about reductions in steel prices averaging 9.4 per cent., leaving them 81 per cent. above the ten-year pre-war average, while copper had dropped to its pre-war average. As to bringing buyer and seller together, what the industrial board did was to reach an agreement with the sellers, the committee of the iron and steel industry, then tried to induce the railroad administration to endorse the prices and place orders, which the railroad administration refused to do, claiming first that the prices were unreasonably high, and secondly that the whole thing was illegal. The Navy Department opened bids for 20,000 tons of steel, after the industrial board's prices had been announced, and finding that they were all at the same

prices returned the bids, on the basis that the law requires competitive bidding. With the railroad administration the industrial board got into a controversy, which has been given much space in the daily newspapers, while with the Navy Department it appears to have had no communication.

The curious thing about the situation is that the daily press despatches from Washington have been uniformly colored along the line that the railroad administration was wrong and the industrial board's efforts to help the country were being needlessly interfered with by the railroad administration. On the other hand, strangely enough, among the very people most interested in prices being maintained, namely the pig iron and steel producers, there has been a constantly growing feeling that the railroad administration is right. Of course, the producers are making no effort to advertise their attitude, but no difficulty is experienced in ascertaining that many of them hold this view.

It may be that these producers have turned against the industrial board simply because it has not succeeded. A more plausible theory, which, of course, it would be difficult to confirm specifically, is that the producers' real cause of dissatisfaction is that the industrial board misrepresented its prospects of securing approval of the Department of Justice. This much is frankly admitted, that at one time the producers believed that it a settled fact that a system of steel price maintenance had been established, not with the Government as neutral in the matter, but with its active countenance and support. This view has, of course, been entirely dispelled by the Attorney-General stating flatly that he has not approved the plan and will not do so. The steel producers lose more by that than by the holding back of a few railroad orders, as there was not much business to be placed in any event.

The only thing that has kept the subject alive at all has been the fact that at the close of last week Secretary Redfield received a cable from the President, to whom both the industrial board and the railroad administration had made appeals, stating their respective viewpoints. The text was not made public, but one might reasonably infer that the President asked that the industrial board endeavor to offer better terms to the railroad administration. If the President had desired to instruct the railroad administration to accept the steel prices, as the industrial board had expressed hopes he would do, the cable presumably would have been sent to the railroad administration instead of to the other party in the controversy.

Market Prospects

The steel market is telling its own story, however. Prices are being strictly maintained, indicating that while the producers have lately been talking much of prospects of an open market they are not yet ready to put such a thing into operation. The buyers are not taking hold, and evidently are waiting for lower prices, perhaps for various other things as well. Among middle interests, well trained in observing matters from a neutral viewpoint, there are predictions made that there will be further steel price reductions by about the middle of June. Whether there will simply be formal reductions or irregular reduction, with more or less of open market conditions, whatever that often-used term really means, is the chief matter of doubt.

There is no question that steel prices can be very greatly reduced without serious injury to producers. The small producers, who are given so much sympathy in the trade and daily press, are in many cases closed already, not because of high costs but because of lack of orders. The high costs frequently cited by large steel producers are due largely to the inclusion of overhead, which is very heavy at present because tonnage is so light. Undoubtedly the steel producers would not make their reductions now if they felt business would be greatly stimulated. Evidently they are not sanguine about the near future in business, but when the peace treaty is signed they may become more hopeful and be willing to make terms with buyers. Even if plans to do so were fully formulated no inkling of the fact would be allowed to leak out.

Pig iron presents theoretically an open market, but inquiry has been for such extremely small lots, generally carloads to 100 tons, that there has been no inducement thus far to quote cut prices. The furnaces will be glad to cut prices when actual demand develops, but by that time few will be in operation, and no great decline is to be expected, at least in the near future.

PIG IRON REVIEW

Pig Iron Market Shows Little Activity—Stocks Increasing and Stacks Blown Out—Waiting for Settlement of Prices

While furnaces are showing willingness to make small concessions in order to get business, little buying is in evidence. That this condition is general is borne out by reports from various points, as follows:

PHILADELPHIA.—An enquiry for 250 tons basic for N. & G. Taylor Co., Cumberland, Md., plant, showed that furnaces are willing to give some concessions to get the business. They were agreeable to standing from 15 to 20 cents of the freight charges against them. Most sales have been for small tonnages. One lot of 750 tons of No. 2 X was sold at $28. Buffalo furnace, for second and third quarter delivery to a Baltimore maker. Two more furnaces have been blown out during the week.

NEW YORK.—A number of export enquiries are going around, from South America, Japan and England, but in most cases no sales result, as foreign buyers find freights too high. Domestic enquiries are very poor and new business light. The price stabilizing plan is admitted to be a failure, and the trade is waiting to see how the market will act when open trading is again in force.

PITTSBURGH.—There is no demand from buyers beyond the present half year, and producers are not anxious to make commitments beyond that period. Producers are instructed to hold their customers to the terms of the contracts already made, and the only revision has been on monthly requirements. Two furnaces are preparing to blow out by the end of the month. The Carnegie Steel Co. have only 36 of their 59 stacks now in full blast.

BUFFALO.—As a contrast to the general stagnation in this district was the report of a sale of 2,300 ton basic and foundry evenly divided, and 600 ton foundry, all for export. Production is very low, in some cases being down to fifty per cent. of capacity. Makers are in general sitting tight, waiting developments.

CLEVELAND.—Some small sales have been made here at the $26.75 base furnace price, mostly in carload lots. The expansion noted last week by some interests dropped off sharply. A sale of 200 tons has been made to a pump manufacturer in the state, and a sale of Alabama high carbon iron for prompt shipment at $26.75 Birmingham. It is probable that more furnaces may be blown out in the near future.

CHICAGO.—Until the price situation at Washington has been cleared up little business is expected. What business is offering is for small quantities for second half delivery. There is a lot of iron piled in yards, and furnaces are still being blown out.

ST. LOUIS.—Furnaces banking and blowing out, with an absolute cessation of business is the state of the market here. This is put down mostly to the upset in Washington, but the trade generally is philosophic.

BIRMINGHAM.—Some furnaces are being blown in but they are more than balanced by others being blown out. Shipments are down to vanishing point, and enquiries infrequent.

SCRAP METAL MARKET

The quietness in the finished steel market is reflected in the scrap metal market. There is some variation in different districts, but the general advance has been halted. Following are reports from districts:

PITTSBURGH.—Some of the large buyers having withdrawn from the market, prices have eased off somewhat. The price controversy in Washington has had a bad effect on the boom that was coming to the scrap market. A sale of car wheels was made recently, 500 tons of car wheels at $24. Heavy melting steel is quoted from $15.75 to $16.

NEW YORK.—Buyers and sellers are awaiting news from Washington. There is a very slow movement in heavy melting and wrought material, and the general situation is one of sitting tight.

PHILADELPHIA. — Prices remain steady, with little business in most grades. Railroad wrought and wrought pipe are the materials most in demand,

and sales are reported in these grades at the advanced prices.

BUFFALO.—There has been a good movement of buying by outside interests, and they are keeping up a good demand for turnings, borings and malleable scrap. Heavy melting steel is in good demand. Prices remain at about the same as last week.

CLEVELAND. — Prices have not changed actually, but the sentiment of the market is towards lower prices. There is not only no buying, but consumers will not even hint as to when they will buy. They are looking for an open market in the near future.

CHICAGO. — The market here has been quieter, but prices remain firm. Any enquiry seems to result in a stiffening of prices. What goods are being offered by the railroads find a ready market. An enquiry for iron and steel axles by a western mill resulted in a sharp advance in both grades.

CINCINNATI. — Some orders have been received here from Pittsburgh and Cleveland for scrap, to be shipped before July 1st. Some grades are firm, heavy melting steel and bundled sheet having advanced 50 cents to $1 a ton.

ST. LOUIS.—The scrap market here is irregular. Some consumers are trying to cancel contracts, and dealers who have been filling their yards now seem anxious to unload, even at less than purchasing price. Railroads are offering between 6,000 and 7,000 tons.

BIRMINGHAM.—No sales and no enquiry is the report from this district. Dealers do not expect any improvement until the railroads begin buying.

BALL-BEARING MANUFACTURERS COMBINE

Of interest to all users of bearings is the just announced combination, effective May 1st, of the Hess-Bright Manufacturing Co., the SKF Ball Bearing Co., the Atlas Ball Co., and the Hubbard Machine Co. The new company, under the name of SKF Industries, Inc., will offer a comprehensive line of ball bearings, including the Hess-Bright deep-groove type, SKF self-aligning radial and thrust bearings and ball-bearing pillow blocks and shafting hangers.

Through the medium of its engineering organization, backed up by a well-equipped laboratory, the new company will be able to place at the service of bearing users the knowledge gained in many years' study of anti-friction bearings of all kinds. On request manufacturers' problems will be analyzed in detail and that type of bearing recommended which (independent of sales considerations) is best suited to the conditions met. In addition the laboratory staff will carry on research studies affectisg anti-friction bearing design and application.

SKF Industries, Inc., is the consummation by physical consolidation of a merger begun some time ago of the four companies mentioned under the direction of B. G. Prytz, president; W. L. Batt, vice-president; J. P. Walsh, controller; and S. B. Taylor, sales manager. The principal office will be at 116 Broadway, New York City, with branches at Boston, Philadelphia, Atlanta, Buffalo, Cleveland, Detroit, Cincinnati, Chicago and San Francisco.

LOOKS FOR BUSINESS TO BECOME BETTER

Canadian Bridge Co. Expects Trade Will Develop to Some Considerable Extent

Windsor.—Willard Pope, vice-president of the Canadian Bridge Company, Ltd., Walkerville, in a statement, declared there are absolutely no grounds for the persistent rumors that that company was about to be absorbed by Canadian Steel Corporation, Ltd.

"The Canadian Bridge Company will continue to run, as in the past, an independent corporation," said Mr. Pope, "and all rumors to the contrary are absolutely without foundation."

Owing to the cancellation of war contracts, the Canadian Bridge Company has been compelled to considerably reduce its staff, but officials are very optimistic as to the future and believe that when peace finally is signed structural work in Canada will again boom.

At present the Canadian Bridge Company is completing the last of eight fabricated merchantmen built for United States Government. Construction work has all been done at Walkerville plant and parts have been shipped to the American seaboard to be assembled. Each of these freighters gave employment to approximately six hundred men for a period of one month. During the continuance of the war the company was entirely engaged in the production of munitions, and when running at full capacity carried a staff of approximately one thousand six hundred hands.

Discussing future prospects for Canadian construction, Mr. Pope said the recent action of the United States Industrial Board in fixing base prices for structural material for 1919 at approximately $7 per ton lower than prevailing prices was sure to have a stimulating effect upon Canadian business.

"During the war," he said, "a lot of structural work was suspended, and now that purchasers who have been holding off in anticipation of lower prices know there will be no further drop in steel this year they will go ahead with all urgent and necessary work."

Another sign that indicates the company soon will have every anvil ringing and every lathe turning is the fact that G. F. Porter, the engineering genius who, as chief engineer of construction, successfully built the Quebec Bridge, will shortly return to assume duties of chief engineer for the company here.

STANDARD SYSTEM OF DIMENSIONS

(Continued from page 411)

After 12 inches all dimensions should be stated as feet and inches."

So I bid my last prospect good bye, and wearily wended my way homeward, where I sat down and wrote this tale of woe. It will save me walking around, and perhaps I'll get to hear of a standard system, or at least hear of a reason why there should be a standard system, or perhaps hear that such a thing is impossible. Personally my spirit of enquiry is weakening. I need oil for my lamp, so, readers in general, do you know of any real, honest-to-goodness proven system, and what success it has had, and why it was adopted?

I'm hoping to read very soon through these columns why we muddle through in such fashion, so out with your views.

SHOP ARITHMETIC

Continued from page 403)

Considerable experiment was done in obtaining a solder for a particular purpose; when it had reached the proper constituency it was found that it contained 10 lbs. of tin; 43¾ lbs. of bismuth; 25 lbs. of lead; and 11¼ lbs. of cadmium. What are the relative percentages of the formula? The total mixture would contain 10 + 43¾ + 25 + 11¼ equals 90 lbs. This then would represent 100 per cent. To find the different rates, divide the percentages by the base; thus:—

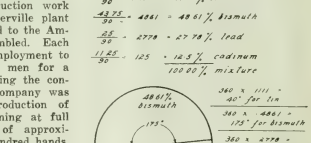
$\frac{10}{90} = .111 = 11.11\%$ tin

$\frac{43.75}{90} = .4861 = 48.61\%$ bismuth

$\frac{25}{90} = .2778 = 27.78\%$ lead

$\frac{11.25}{90} = .125 = 12.5\%$ cadmium

100.00% mixture



To construct the chart, draw a circle and find the desired angles corresponding to the different percentages by multiplying 360 by the various percentages expressed decimally.

"Sorry, Brown," said the doctor after the examination, "You're in a very serious condition. I'm afraid I'll have to operate on you." "Operate?" gasped Brown. "Why, I haven't any money for an operation. I'm only a poor working man." "You're insured, are you not?" "Yes, but I don't get that until I am dead." "Oh, that will be all right," said the doctor consolingly.

"Is your husband much of a provider, Malindy?" "Well he jes' ain't nuthin' else, ma'am. He's gwine to git some new furniture providin' he gits de money, an' he's gwine to git de money providin' he goes to work; an' he's gwine to go to work providin' de job suits him. I shoh' never did see sich a providin' indowdgil in all mah bohn days."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh $27 15
Lake Superior, charcoal, Chicago 34 60
Standard low phos., Philadelphia .....
Bessemer, Pittsburgh 29 35
Basic, Valley furnace 25 75
Toronto price:—
Silicon..2.25% to 2.75% $32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto.....	$ 4 25
Steel bars, base, Toronto.....	4 25
Steel bars, 2 in. to 4 in. base....	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal.....	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	**11 00**
Tire steel	**5 50**
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.....	9 25
Chequered floor plate, ¼ in.	9 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill.....	
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh....	2 45
Steel hoops, Pittsburgh	3 30

F.O.B., Toronto Warehouse

Small shapes	4 50

F.O.B. Chicago Warehouse

Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 lbs. C.L.	L.C.L.
Montreal	29	39½
St. John, N.B.	47½	63
Halifax	49	64½
Toronto	23½	27½
Guelph	23½	27½
London	23½	27½
Windsor	23½	27½
Winnipeg	81	106½

METALS

Lake copper	$19 00	$20 00
Electro copper	18 50	19 00
Castings, copper	17 25	19 00
Tin	60 00	58 00
Spelter	9 00	8 50
Lead	6 75	7 50
Antimony	8 00	8 50
Aluminum	35 00	40 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 4 50
Plates, 3-16 in.	5 50	4 90

Price List No. 38

Standard Buttweld

Per 100 feet		
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8I. in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10I. in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$10 50	$10 00
Copper, crucible	13 00	12 75
Copper, heavy	13 00	12 75
Copper wire	13 00	12 75
No. 1 machine composition	10 00	12 00
New brass cuttings	8 00	9 00
Red brass turnings	8 00	8 50
Yellow brass turnings..	6 00	6 00
Light brass	5 00	5 00
Medium brass	7 00	6 00
Scrap zinc	4 00	5 00
Heavy lead	3-4	4 00
Tea lead	2-3	3 00
Aluminum	15 00	12 00

	Per Ton	
Heavy melting steel....	10 00	9 00
Shell turnings	6 00	6 00
Boiler plate	10 00	8 00
Axles (wrought iron) .	20 00	15 00
Rails	15 00	11 00
Malleable scrap	15 00	12 00
No. 1 machine cast iron	18 00	14 00
Pipe wrought	9 00	5 00
Car wheels	20-22	18 00
Steel axles	22 00	20 00
Mach. shop turnings ..	5 00	5 00
Stove plate	12 00	10 00
Cast boring	8 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅝" and less.....	35
Carriage bolts, 7-16 and up.....	15
Coach and lag screws.....	50
Stove bolts	65
Wrought washers	45
Elevator bolts	25
Machine bolts, 7-16 and over	25
Machine bolts, ⅜ and less.....	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd brass	net
Nuts, square blank .....add	$0 75
Nuts, square, tapped .....add	1 00
Nuts, hex., blank .....add	1 00
Nuts, hex., tapped .....add	1 25
Copper rivets and burrs, list plus	15
Burrs only, list plus	40
Iron rivets and burrs .....40 and	5
Boiler rivets, base ¾" and larger	**$ 8 50**
Structural rivets, as above.....	**$ 40**
Wood screws, flat, bright.....	75
Wood screws, O. & R., bright....	70
Wood screws, flat, brass	40
Wood screws, O. & R., brass	.5
Wood screws, flat, bronze	30
Wood screws, O. & R., bronze....	27½

MILLED PRODUCTS

	Per Cent
Set screws	25
Sq. and Hex. Head Cap Screws..	20
Rd. and Fil. Head Cap Screws....	net
Flat But. Hd. Cap Screws.....plus	net
Fin. and Semi-fin. nuts up to 1 in.	25
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and Semi-fin. nuts over 1½ in., up to 2 in. .....plus	10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws.....list plus	20
Collar screws.....list plus 30,	10
Thumb screws	20
Thumb nuts	65
Patch bolts .....add 40,	10
Cold pressed nuts to 1½ in..add	$4 50
Cold pressed nuts over 1½ in..add	7 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up.....	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly 0 34
Solder, guaranteed 0 39
Babbitt metals ..... 18 to 70
Soldering coppers, lb. 0 58
Lead wool, per lb. 0 14
Putty, 100-lb. drums 6 75
White lead, pure, cwt. 17 80
Red dry lead, 100-lb. kegs, per cwt. 15 50
Glue, English 0 35
Tarred slater's paper, roll 1 30
Gasoline, per gal., bulk 0 33
Benzine, per gal., bulk 0 32
Pure turpentine, single bbls.,gal. 1 10
Linseed oil, raw, single bbls. 1 70
Linseed oil, boiled, single bbls. 1 73
Plaster of Paris, per bbl. 4 50
Sandpaper, B. & A. ..... List plus 43
Emery cloth ..... list plus 37½
Sal Soda 0 03½
Sulphur, rolls 0 05
Sulphur, commereial 0 04½
Rosin "D," per lb. 0 07
Rosin "G," per lb. 0 08
Borax crystal and rgranular 0 14
Wood alcohol, per gallon 2 00
Whiting, plain, per 100 lbs. 2 50

CARBON DRILLS AND REAMERS

Per Cent.

S.S. drills, wire sizes up to 52 35
S.S. drills, wire sizes, No. 53 to 80 40
Standard drills to 1½ in. 40
Standard drills, over 1½ in. 40
3-fluted drills, plus 10
Jobbers' and letter sizes 40
Bit stock 40
Ratchet drills 15
S.S. drills for wood 40
Wood boring brace drills 25
Electricians' bits 30
Sockets 40
Sleeves 40
Taper pin reamers ..... net
Drills and countersinks..list plus 40
Bridge reamers 50
Centre reamers 10
Chucking reamers ..... net
Hand reamers 10
High speed drills, list plus 75
High speed cutters, list plus 40

COLD ROLLED SHAFTING

At mill ..... list plus 5%
At warehouse ..... list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28...	$ 6 55	$ 6 00
Sheets, black, No. 10...	5 15	5 45
Canada plates, dull, 52 sheets	8 50	8 00
Can. plates, all bright	8 50	9 00
Apollo brand, 10% oz. galvanized	.....	.....
Queen's Head,28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28.	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S...	.....	7 95
Premier, 10% oz.	.....	8 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

B

¼ in., $14.35; 5-16 in., $13.85; ⅜ in., $13.50; 7-16 in., $12.90; ½ in., $13.20; $13.00; ⅝ in., $12.90; 1 inch, $12.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

Prices per 100 lbs.

FILES AND RASPS.

Per cent

Globe 50
Vulcan 50
P.H. and Imperial 50
Nicholson 32½
(In Canada) 27½
J. Barton Smith, Eagle 50
McClelland, Globe 50
Delta Files 20
Disston 40
Whitman & Barnes 50
Great Western-American 50
Kearney & Foot, Arcade 50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb. .....
Royalite, per gal., bulk 19½
Palacine 22½
Machine oil, per gal. 27½
Black oil, per gal. 16
Cylinder oil, Capital 52
Cylinder oil, Acme 39½
Standard cutting compound, per lb. 0 06
Lard oil, per gal. $2 60
Union thread cutting oil, antiseptic 88
Acme cutting oil, antiseptic 37½
Imperial quenching oil 39½
Petrolum fuel oil, bbls. net 10¾

BELTING—No 1 OAK TANNED

Extra heavy, single and double.. 30%
Standard 30, 10%
Cut leather lacing, No. 1 ..... 2 20
Leather in sides 1 75

TAPES

Chesterman Metallic, 50 ft. $2 00
Lufkin Metallic, 603, 50 ft. 2 00
Admiral Steel Tape, 50 ft. 2 75
Admiral Steel Tape, 100 ft. 4 45
Major Jun. Steel Tape, 50 ft.. 3 50
Rival Steel Tape, 50 ft. 2 75
Rival Steel Tape, 100 ft. 4 45
Reliable Jun. Steel Tape, 50 ft.. 3 50

PLATING SUPPLIES

Polishing wheels, felt 3 25
Polishing wheels, bull-neck.. 2 00
Emery in kegs, American 07
Pumice, ground ..... 3½ to 05
Emery glue ..... 28 to 30
Tripoli composition ..... 06 to 09
Crocus composition ..... 08 to 10
Emery composition ..... 08 to 09
Rouge, silver ..... 35 to 50
Rouge, powder ..... 30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive ..... .08½
Grits, 80 and finer ..... .06

BRASS

Brass rods, base ½ in. to 1 in. rod 0 38
Brass sheets, 24 gauge and heavier, base 0 43

WASTE

Brass tubing, seamless 0 46
Copper tubing, seamless 0 48

XXX Extra..19½ Atlas 17
Peerless ..... 19 X Empire 15½
Grand ..... 18 Ideal 16
Superior ....18 X press 14
X L C R 17

Colored.

Lion ..... 15 Popular **12**
Standard **13½** Keen **10¾**
No. 1 ..... 13½

Wool Packing.

Arrow ..... 25 Anvil **15**
Axle ..... 20 Anchor **11**

Washed Wipers.

Select White. 11 Dark colored. **09**
Mixed colored 10

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard ... 10% Best grades .. 15%

ANODES.

Nickel	.58 to	.65
Copper	.38 to	.45
Tin	.70 to	.70
Zinc	.18 to	.18

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10..		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Boilers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft....	$10 25	$11 50
Sheets, 3½ lbs. sq. ft...	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size ½c per lb. extra.

PLATING CHEMICALS.

Acid, boracic ..... $ .25
Acid, hydrochloric ..... .06
Acid, nitric ..... .14
Acid, sulphuric ..... .06
Ammonia, aqua ..... .23
Ammonium carbonate ....
Ammonium, chloride ..... .55
Ammonium hydrosulphuret ..... .30
Ammonium sulphate ..... .15
Arsenic, white ..... .27
Copper, carbonate, annhy ..... .50
Copper, sulphate ..... .22
Cobalt, sulphate ..... .20
Iron perchloride ..... .40
Lead acetate ..... .35
Nickel ammonium sulphate .... .25
Nickel carbonate ..... .32
Nickel sulphate ..... .35
Potassium carbonate 1.80
Potassium sulphide (substitute) 2.25
Silver chloride (per oz.) 1.45
Silver nitrate (per oz.) 1.20
Sodium bisulphite ..... .15
Sodium carbonate crystals ..... .05
Sodium cyanide, 127-130% ..... .40
Sodium hydrate ..... .22
Sodium hyposulphite, per 100 lbs. 6.00
Sodium phosphate ..... .18
Tin chloride 1.75
Zinc chloride, C.P. ..... .80
Zinc sulphate ..... .15

Prices per lb. unless otherwise stated.

FINDING OUT FOR CERTAIN WHAT THE RETURNED SOLDIER CAN WORK AT

THE industrial survey, introduced and developed in Canada by the vocational branch of the Invalided Soldiers' Commission, has proved of such service that it is being extended to industrial and mercantile establishments of all kinds. The idea has been developed in the following manner:

To discover, classify, and systematize the possible openings for discharged disabled soldiers, the director of the vocational branch, Mr. W. E. Segsworth, engaged the services of Mr. Gerald Boate, who has made extended and minute study of the industrial survey. Returned men of suitable experience and character were engaged and rapidly instructed in their duties. The work was begun in the autumn of 1917. The first survey was conducted in the Angus shops of the Canadian Pacific Railway at Montreal, and what was done there will illustrate the general principle and operation of the survey.

In October, 1917, permission was obtained from H. Osborne, works manager of the Angus shops, to investigate that establishment. Between six and seven thousand workmen were employed there, the work falling into two broad divisions—the engine shops, and the car shops. In all, there are about 130 specific kinds of jobs regularly performed. It was the task of Mr. Boate, who was the surveyor, to find out the requirements of each job in respect of physical effort and mental capacity, and to state what kind of degree of physical disability did or did not unfit a worker for each kind of employment.

The electrical department of the engine shop was first visited. Here Mr. Boate found four sub-classes of work, as follows:

1. Motor and generator armature winding.
2. Inside electrical repairs.
3. Electric crane operators.
4. Outside electrical maintenance men

A summary of the description of subclass number one will illustrate the whole method.

Motor and Generator Armature Winders

Several women had been employed for about nine months and had become very proficient. One man with a deformed spine was working there. The work is done sitting and requires little muscular exertion, and is thus suited to many kinds of physical disability. The job consists of stripping motor and generator armatures ranging in size from one-eighth to 450 horse power. One thousand motors between Halifax and Fort William are kept in repair by this department. Seventy-five per cent. of the following light bench work may be done sitting: coil winding, taping, soldering, connectng coil ends and assembling commutators and coils in the armature. There is such a variety of operations that training should be given where the work is done, or at least the final stages of training should be carried on in the shop. Five or six months is su cient to make a workman efficient. The general work most closely related to this is lathe work and kinds of coil winding on lathes; outside lighting and motor winding in factories, power-houses, and car shops. Necessary experience is gained while working at repairs on various kinds of coils under instructios of the foreman. It is possible for those taking part of their retraining course at this shop to attend the C.P.R. apprentices' school. Apprentices are allowed to attend school in the plant two hours a day twice a week during their apprenticeship.

It is necessary that a workman should be able to read, write, keep time-cards, and be of average intelligence. In the opinion of the superintendent of the department, the retraining necessary covers arithmetic, science applied to electricity, making time-cards, handling and reading arnmeters and voltmeters, familiarity with the sizes and makes of wire, and geseral shop practise. The surroundings are not favorable for those suffering from lung wounds or diseases. Good eyesight is necessary, but partial deafness will not disqualify. The worker must have good

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

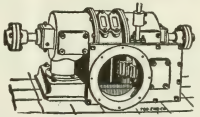
The Thos. Davidson Mfg. Co., Limited

Steel Foundry Division, Lachine Canal

Head Office: 187 Delisle St. MONTREAL

Phone Victoria 1492

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

J. C. WILSON & CO.

BELLEVILLE, ONTARIO

arms and hands, with very supple fingers; but loss of or injury to other limbs does not interfere with his usefulness very much.

The above is given as a typical analysis of the different jobs in the Angus shops. The relation of physical disability to each specific job is determined. The physically handicapped discharged soldier is given the training to fit him for a given job, and the job is chosen to suit his capacity.

The industrial survey, therefore, furnishes the groundwork for a very comprehensive scheme of employment. Already hundreds of industrial and mercantile concerns have been surveyed, and many hundreds of partially disabled men have been placed at suitable work.

The system of industrial retraining is applicable to more than the returned soldier. It will apply to that great and ever growing army of industrial cripples from the railways, mines, factories, and other industrial lines. The industrial survey, properly applied, will make it possible to lift the disabled from a condition of dependence to that of the self-respecting wage earner; and the vocational branch has blazed the path.

EXTENSIONS ARE BEING MADE TO PLANT OF STEEL CORPORATION

SYDNEY—The Dominion Steel Corporation is making progress in the extension on the plant which have been planned for and which have been found necessary to meet the demand for their products and to meet the demand for labor employment.

Work on the construction of the new power house has been started by the Foundation Company. The plans for the building which were finally accepted by the engineer of the company, A. G. Thurkaff, were drawn by A. E. Dore of the Foundation Company staff. The building is specially designed with a view to further extension when that shall be necessary to future plans of the company which it is understood will include the operation electrically of all departments. The present building will be used in conjunction with the old building but later the old building wil be discarded entirely. The new power house will be built just north of the blast furnace boiler house where there is plenty room for enlargements.

The second battery of coke ovens which were under construction by the By-Products Co., are being made ready for the first bank which will likely be placed and lighted on the first of April. This marks the completion of two years' work by the By-Products people, the first bank of sixty ovens having been opened last year.

Wabena, the Steel Company's source of ore supply in this country, it to have a new power house also. The mine at Wabana has always been electrically operated and the new power house means the extension of the work there. There will be a large power house with two generators of 2,000 k.w.'s each and three sub-stations for the lower voltage. The construction on this has already started.

STEEL COMPANY'S STATEMENT FOR 1918

Steel Company of Canada's annual statement, which reached the shareholders on Saturday, proved to be much in line with general expectations, the gross earnings for 1918 being $5,367,120, as compared with an excess of $6,000,000 the previous year, or an actual falling off of $673,198. Gross for 1918, however, is $345,729 over that of 1916, and, altogether the showing was regarded as a highly satisfactory one.

After all deductions, including the allowances for fire insurance, reserve and pension fund, there remained available for dividends on the outstanding $11,500,000 of common stock the sum of $1,815,017, or equal to 15.7 per cent., as compared with 19.5 per cent. in 1917 and 18.4 per cent. in 1916. The balance brought forward to the credit of profit and loss account at the end of the year was $7,322,872, or $1,125,017 more than at the end of 1917, representing over 40 per cent. of the combined preferred and common stock of the company outstanding.

The company continues to enjoy a comfortable financial position, current assets exceeding current liabilities by over $12,000,000, or less by about a million than was the case in the previous statement. Actual cash on hand of $805,828 is less by some $565,000 than at the end of 1917, but the difference is accounted for by a corresponding increase of about the same amount in "other securities," which include Government bond issues, to which the company was a generous subscriber during the war.

Current Events in Photograph

MAIN CAISSON OF HUGE DRY DOCKS

The banks of the St. Lawrence River, near the ancient town of Levis, are once more resounding as in days gone by, to the ring of axe, adze and caulking hammer, also to the more modern clatter made by pneumatic riveters and the snap of plate punches. The reason for all this is the great shipbuilding activity going on at Lauzon, a village just below Levis. One of the new dry docks, of which the main caisson is shown in the photo, is claimed to be the largest in the world.

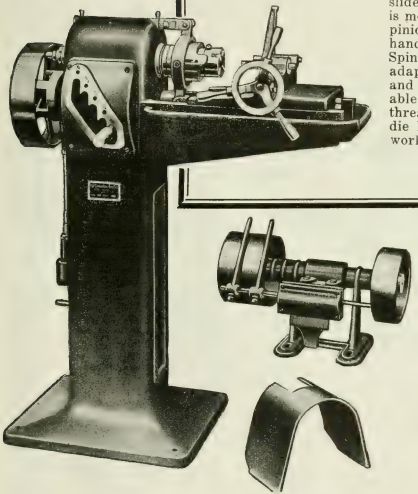
THE BETTER WAY

Just the way that suits. Small parts are most economically threaded with the Geometric Threading Machine. Busy automatic screw machines cannot profitably be slowed down to cut threads when there is a Geometric Threading Machine at hand. Especially since a Geometric Threading Machine costs one-tenth the price of automatics.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut $\frac{1}{8}$ to $\frac{1}{2}$ inch, $\frac{1}{4}$ to $\frac{3}{4}$ inch, and $\frac{3}{4}$ to $1\frac{1}{2}$ inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.



A line from you brings full details regarding this machine. Tell us your threading requirements — let us recommend the proper Geometric Collapsing Tap or Self-opening die.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents :

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

ENGINEERING

Philadelphia.—The Electric Furnace Construction Company, Finance Building, Philadelphia, reports the successful starting up of a special "Greaves-Etchells" type of electric furnace for the manufacture of corundum at the works of the Wm. W. McGregor Co., Airdrie. The material used for the charge is the waste dust accumulated from the crushing of natural corundum. This was practically useless and was considered to be a waste product. A charge of 7 tons of this material was treated in approximately eight hours. The total energy consumption was 3,500 units and the usable corundum ingots weighed nearly four tons. Results of the tests made gave great satisfaction and promise a new field for the electric furnace. We understand that a fairly constant load was obtained throughout the whole of the operation.

TRADE GOSSIP

Victoria.—The mechanical equipment of the Cholberg yards has been increased by the addition of a new steam driven air compressor, and a large increase in the pine line is contemplated.

New Nurses' Home.—Work will shortly be commenced on the new nurses' home to be erected by Jacob Kaufman, a prominent manufacturer of Kitchener. This will be for the nurses in the Kitchener and Waterloo Hospital.

Victoria.—A company has been formed, with a capital of $100,000, to build and equip a floating drydock, and to build tugs and small craft. A thoroughly modern machine shop is to be erected, and the company will specialize in repair work.

Checking the Coal Dealer.—By a new law put on the statute books this session, a coal dealer is prevented from taking orders for coal early in the season, under promise of later delivery. Unless he is in the position to deliver the goods, he is not allowed to take the order. This will help to protect the consumer.

Greeks Looking for Trade.—It is understood that a Greek commercial mission will shortly leave Greece for Canada. The object of the mission will be to determine to what extent Canadian industries can supply Greek requirements, and to arrange means for the placing of Greek orders in Canada.

VICTORIA.—The Harbor and Marine Co., Ltd., is being incorporated to build a plant for the construction of two 8,100 ton steamers for the Dominion Government. The head of the new firm will be C. J. V. Spratt, of the Victoria Machinery Depot, Ltd. The vessels will be commenced as soon as steel is received.

To Investigate Lumber.—The British timber controller, Sir James Bell, is coming to this country shortly to investigate the possibilities of the Dominion's timber. Sir James has been in frequent communication with Mr. Lloyd Harris, of the Canadian Trade Commission, on the question of importing timber from Canada.

Natural Gas Development. — A company is being organized, under the name of the Western Natural Gas Corporation, Limited, under Dominion charter. It is understood that their representatives will apply shortly to the Winnipeg City Council for a franchise to supply the city with natural gas from the fields in Western Saskatchewan.

Trouble in Nova Scotia.—Hints of a general strike unless the Government passes the eight-hour day legislation before July 1, were embodied in a resolution unanimously passed by the labor men of Cape Breton in a big meeting held at Sydney, N.S., Sunday afternoon. C. C. Dane, president of the Provincial Labor Congress, presided. It was stated that the resolution was intended to facilitate the consideration of the bill which it was claimed should have been disposed of in March last. A committee consisting of C. C. Dane, Michael Barnes and J. A. Gillis, was appointed to go to Halifax to urge the necessity of the eight-hour day upon the local House.

CHASE TRACTOR PLANT EXPECTS TO OPERATE IN THE CLUFF BROS.' FACTORY

The first of the large number of American industries which are expected to locate in Canada as a result of the impending British Imperial Preferential Tariff is being located in Toronto through the efforts of E. L. Cousins, City Industrial Commissioner, and R. J. Cluff, of Cluff Brothers, manufacturers of munitions and plumbing supplies. The industry is the Chase Tractor Company, Limited, which will commence shortly to manufacture in Toronto the Chase motor tractor, for the purpose of meeting the great demand for agricultural implements, which is expected to follow the conclusion of peace. The company will open operations in the building lately occupied by the Cluff Ammunition Company at 28 Atlantic avenue, but when the business develops a site will be secured in the Eastern Harbor Terminal at the foot of Cherry street, and a modern plant will be erected at that point.

Headquarters in Toronto

The Chase motor tractor was invented and manufactured by the Chase Motor Truck Company of Syracuse, N.Y., and has proven a great success in the United States, so much so that it attracted the attention of R. J. Cluff while he was in Dayton, Ohio, superintending the manufacture of shell forgings by the Dayton Ohio Production Company, which was controlled by the Cluff interests. As a result of his investigations Mr. Cluff became satisfied that this tractor has a great future and will appeal strongly to the Canadian farmers, and negotiations with the owners of the patents resulted in the purchase outright by the Cluff interests of all the rights and patents to this tractor held by the Chase Motor Truck Company, followed by the removal of the site of this industry from Syracuse to Toronto.

The Syracuse factory has been closed down and the Chase Company has also discontinued the manufacture of motor trucks, so that the headquarters of the new company will be in Toronto, and from this point the trade of the world will be supplied with these tractors.

R. J. Cluff, president of the company, expresses the greatest optimism over the outlook for the new company in particular and Canadian industries in general.

"Canada is going to experience a great period of expansion," said Mr. Cluff, "and we are simply trying to take advantage of the good times that we feel are coming."

"I am very much pleased at being able to secure this industry for Toronto," said Mr. Cousins. "I believe it will develop into a very large industry which will occupy an important location in the Eastern Harbor Terminal, and I think it is only a forerunner of many other industries which will locate in Canada as a result of the British preferential tariff, and of which we hope to secure a good share for Toronto."

BELTING

What Belts Should I Use

? FOR HIGH SPEEDS
FOR WET PLACES
FOR HOT PLACES
FOR COMPRESSOR DRIVES ?

The advice given herewith, if followed closely, is sure to increase your belting service and save money, time and worry.

HIGH SPEEDS

From 3,000 to 3,500 feet per minute is considered a normal belt speed. Four thousand feet per minute and over is a high speed, and are in the selection of the belt must be exercised. A belt that is quite flexible is required, and if the pulleys are small, this is absolutely necessary. For this work a leather belt especially adapted for this kind of work is good. Balata belts also give good results. They should be as light as the requirements will allow, and should be put on tight to avoid slipping. It is extremely desirable to use as light a belt as possible on high speed work in order to obtain flexibility. A great many plant managers have belting troubles through ordering too heavy a belt.

WET PLACES.

It is very necessary to distinguish between drives in which the belt is subject to wet conditions all the time, and one in which the belt is only wet some of the time. In the latter instance the belt must be really waterproof, not just "waterproofed." The general types of belting that come under this heading are Balata belts and Rubber belts. The method of making a Balata belt (saturation of the fabric with the gum) makes a belt that is thoroughly waterproof. The method of manufacturing a rubber belt (rolling the rubber into the fabric) does not make a belt that is thoroughly waterproof. When the belt wears down to the canvas the exposed surface of the canvas absorbs moisture. In places where the belts are always wet, either of the above types can be used, but we can offer another that will give at least as good service and is considerably cheaper. Scandinavia belting, our solid woven belting, is admirable for this purpose. It is true that it shrinks when wet, but if the belt is always to remain wet you can readily understand this makes no difference. The wearing qualities of this belt under these conditions is great. Scandinavia belting would not be satisfactory under conditions that change from wet to dry, as the belt would shrink and expand as the wet conditions changed to dry.

HOT PLACES.

We recommend Scandinavia and Rubber belts for drives when the temperature is over 110° F. We have Scandinavia belts running in temperatures that are around 200° F., and giving splendid satisfaction. Before putting a Scandinavia belt on a drive of this kind, it should be well heated by leaving it for some time in a hot place, as over a boiler. If the belt is then put on with a belt stretcher, most of the stretch can be taken out at once. Do not use Balata belts in temperatures over 110° F., as the gum softens at about 120° F., and if the belt happens to have a spliced joint the splice would come apart. The plies would also have a tendency to open up.

COMPRESSOR DRIVES

On Compressor Drives and on similar work when the load is intermittent, we recommend Lanco Balata Belting, except where extra weight is required on the belt. Some compressor manufacturers do not allow enough face on their pulleys to carry a belt of the proper width. In cases like these it is hard to get the necessary weight in a Balata belt. Where the pulleys are wide enough for a Balata belt it makes a particularly good means of transmission for this class of drive. A cemented joint is generally required for this class of work, and a belt with as little stretch as possible should be used. Balata fulfils the above requirements, and in addition, will stand all kinds of cold weather. In fact, it will stand practically all atmospheric conditions except those of heat. In figuring out the size of belt for compressor and similar drives, always figure a belt 40% heavier than would be required under normal belt conditions. This 40% is allowed on account of the intermittent load.

Watch for our next article giving advice on the belts you should use for

MAIN BELTS AND DIRECT DRIVES, SHIFTERS, OILY PLACES, FOUNDRY CASES, ETC.

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SCANDINAVIA BELTING

LANCO BALATA BELTING

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172 John St., Toronto

A Good Sized Order.—MacKinnon Steel Co., Sherbrooke, Que., are starting the erection of two large tower derricks with 90 foot booms, all steel work for which has been fabricated by them, for the Davie Shipbuilding & Repairing Co., Lauzon, Que. This company has recently completed a 7X480 foot crane runway, for the same company.

Plant to Resume.—The E. Long Manufacturing Co., of Orillia, having completed their adjustments with the Imperial Munition Board, arising out of their shell-making activities, are now turning their attention to getting on a peace footing. They have about 25 men at work dismantling and removing the shell machinery, and installing new machinery, with a view to resuming the making of saw mill and mining machinery. Some of the shell machinery will be adapted to the new purpose but most of the machinery will be new. The company hope that within a year they will have a larger business than in prewar days.

A Famine in Lumber.—That the world was facing a famine in lumber was the statement made by Roger E. Simmons, before the legislative committee of Congress. Mr. Simmons was sent to Russia in 1917 as a member of the United States Government Commission, to study the lumber situation in the war swept countries. Incidentally he was captured by Bolsheviki, and at one time sentenced to be shot. He said that prices of lumber were bound to rise for the next few years, as there would be an unprecedented demand from all countries devastated by the war, and most of this demand will have to be met by the United States and Canada.

Will Return Soon.—A despatch from Paris states that Lloyd Harris, head of the Canadian Trade Commission to Europe, is returning to Canada shortly to discuss with the Government and impress the people of Canada the growing opportunities of increasing Canadian trade in Europe, especially the Balkans. After a thorough investigation and study of all the phases of the situation, together with his knowledge of Canada's agricultural and natural wealth and industrial achievements, he is convinced that with courage as well as discipline the great war debt will be wiped out in a few years by the extension of Canada's foreign trade. He will urge this policy on the Government and impress on the industrial leaders the need of immediate action to organize Canadian effort. Sir Robert Borden, who has been in close touch with the situation, shares the views of Mr. Harris.

May Have Nitrogen Industry.—An interesting address was heard by the Toronto branch of the Society of Chemical Industry, at the Engineers' Club recently. The lecturer was Dr. A. J. Harker, director of research for Munitions Inventions Department, London, Eng. The speaker told of the good work that had been achieved in England in the production of ammonia nitrate and how the difficulties had been overcome and new processes worked out. The production of ammonia nitrate had been stimulated by every possible means. There were three possible ways available. Nitrogen from the arc process, using much electric power; (2) the cyanide process from nitrogen and calcium carbide; (3) the Haber process for ammonia from liquid nitrogen and hydrogen. It was pointed out that the large available water powers of the St. Lawrence might be used to supply the ever-increasing demand for nitrates in farming operations, and to establish an industry that could compete on the world's markets.

Piano Business Good.—That times are good in the piano trade is evident from the reports coming from two of the leading firms. An announcement was made recently by the Bell Piano & Organ Co., that in future the factories would work only nine hours a day, but the employees would receive pay for the ten hours as before. Almost simultaneously comes the announcement that the C. W. Lindsay Co., after paying dividends of 7 per cent. on the preferred and 8 per cent. on the common, voted a bonus of 10 per cent. cash, payable on May 1, to all employees who have been in the employ of the company since March 1, 1918.

Purchasing Agents Organize.—At a meeting held at the Walker House, the Purchasing Agents' Association of Toronto was formed, twenty-eight (28) members being admitted to chartered membership. The objects of the association are to provide for the regular meeting together of purchasing agents, with the resulting exchange of ideas and opportunities for closer relationship between them, to foster and promote among the members at the meetings and elsewhere, by means of speeches, discussions and whatever other means possible, a more thorough knowledge of the products bought by the members, more uniform and efficient purchasing routine and methods, better standardized specifications, classifications, etc., and more improved methods for disseminating market information and whatever else may be deemed proper and advisable to secure the advance of purchasing to a higher level and the individual betterment of its members. The discussion of prices, discounts or other confidential information will not be permitted at any meeting. J. I. Nicholson, of Gunns, Ltd., was elected president; W. F. Dodd, of Canadian Kodak Co., vice-president; G. P. Beswick, Polson Iron Works, secretary, and W. McG. Brown, of Brown's Copper and Brass Rolling Mills, treasurer. Application has been made for affiliation with the National Association of Purchasing Agents, which has a membership of forty-eight hundred (4800). Regular monthly meetings will be held.

THIS WEEK'S MONTREAL NOTES

Extensive improvements are anticipated by the Montreal Harbor Commissioners this year, chief among which will be the electrification of all the rail way mileage on the water front. This improvement is a part of the original plan in 1914, but was interfered with by the war. Connected with the scheme is the joining up of the electrified C.G.R. with the harbor system by overhead tracks from Lagauchetiere street, the present terminal of the line.

Plans are now under way for the erection of a large hippodrome in the east-end for the accommodation of sporting events and automobile exhibitions and general displays of manufactured articles and farm products, etc. Seating capacity will be provided for 20,000 people.

The Montreal Municipal Garage is nearing completion and is expected to be in operation by the first of June. It is the policy of the Commissioners to centralize establishments with the view of economy, and the building, which is 380 feet long, 100 feet wide, and 177 feet high, is provided with every facility for efficient and economic operation.

The C.P.R. are planning to engage in more active construction work this year, especially extension of lines in the West and the general improvement of road facilities. In speaking of prospects, Mr. E. W. Beatty, the president, stated that he was looking for a decided improvement in the labor situation. He believes that the present stress is gradually easing off and that everyone is contemplating to step more briskly when the peace treaty is finally signed.

Through the intervention of Hon. G. D. Robertson, Minister of Labor, the Canadian Express strike has been called off, both the employees and the company agreeing to submit their differences to the Canadian Railway Board for settlement.

The Association of Montreal Building and Construction Industries are cooperating with the Administrative Commission, with the object of revising the building by-laws of the city. Those appointed by the association are J. P. Anglin, K. D. Church and E. B. Evans.

Moving this year in Montreal is going to be still more expensive owing to the strike of carters that threatens to disarrange the annual moving programme. 90 per cent of which takes place within a couple of weeks about the first of May; 3,000 are now out.

The Mechanics' Institute on Attwater Ave. is now complete and the books are now being transferred from the old building. Available book space in the new home will provide for 30,000 volumes. Some changes are to be made in the policy of the Institute; the rooms are to be free to readers, and as the building is to be used for the furtherance of education it will be exempt from taxation.

BOOK REVIEWS

The Dominion Forge & Stamping Co., Ltd., Walkerville, Ont., have issued quite an attractive catalogue, showing exterior and interior views of their forge plant, their sheet metal plant and the automobile frame plant. The company are equipped to make all kinds of forgings,

stampings and heavy drawn steel parts to specification, and from this catalogue a manufacturer can obtain an idea of the excellent facilities the company have for turning out this class of product, particularly in large quantities. For instance, illustrations are shown of the steam hammer shop with its twenty steam hammers ranging in capacity from 6,000 to 600 pounds, of the board hammer shop with its fifteen Board hammers, ranging in capacity from 800 to 2,000 pounds, of the forging machine department, with its five up-setting machines. Also there are shown illustrations of the stamping plants with their three hundred presses, capable of forming steel sheets cold up to ⅜ in. thick. Illustrations of special note are the two die sinking and tool making departments where all the forging and stamping dies and tools are made. There are also four pages of illustrations of typical forgings, stampings and heavy steel-drawn parts made for various customers. Any manufacturer using forgings or steel stampings of any kind should be much interested in this catalogue, copy of which will be sent on request.

PERSONAL

Captain W. B. Elliott, son of W. J. Elliott, manager of the Whitman & Barnes Manufacturing Company factory, located at St. Catharines, has returned from overseas service. Capt. Elliott, who is but 20 years old, is credited with taking part in 100 bombing raids, having led the majority of the raids. He was employed at the office of the Whitman & Barnes' factory prior to enlistment. He will resume studies at the University of Toronto. He has been awarded the Distinguished Flying Cross, and the "London Standard," in an article published recently, paid tribute to his conduct. The "Standard" article follows: "This officer (Captain W. B. Elliott) has taken part in one hundred bombing raids, in the majority of which he has been the leader, a position for which he has the essential qualities in a marked degree, viz., courage, resolution and resource. While leading one bombing raid his formation was attacked by thirty hostile machines, ten of these being destroyed, the objective successfully bombed, and the formation returned without the loss of a machine. This brilliant success was mainly due to Captain Elliott's skilful leadership."

MARINE

The vessel is a sister ship to the General Currie and General Morrison, recently launched, and is of full canal size, 261 feet by 43 feet 6 inches by 27 feet 6 inches deep. The usual triple expansion engines and Scotch marine boilers are fitted.

Toronto.—The launching of the General Turner was attended by a Masonic organization in full regalia, the sponsor being the wife of the Illustrious Potentate, Rameses Temple, Mystic Shrine. The Shriners attended in full regalia, with their band, and made quite a dash of color in the prosaic shipyard.

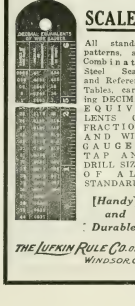
Montreal. — The Canada Steamship Lines, Ltd., have arranged, in conjunction with the Compagnie Generale Transatlantique, for a service between Montreal and French ports. This, it is hoped is but the beginning of a foreign trade that will carry the Canadian flag to all parts of the world.

New Company. — The International Mfg. & Supply Co., Ltd., have a Dominion charter and will handle railway and marine supplies, including a complete line of flexible and metallic packing. W. J. Carrigan is managing director and J. T. Dohne is manager. The head office is 471-3-5 St. James Street, Montreal.

Montreal.—The Houston Lines are inaugurating a service between Canada and Argentine. The first sailing will be by the Alan Keith, from Montreal, about May 5. This will be followed by monthly sailings, St. John, N.B., being the winter port. This will be of great benefit to Canadian shippers, who have hitherto been compelled to ship their merchandise via New York.

Quebec.—Officials of the Canadian Pacific Ocean Services, at a conference with Mayor Lavigueur, held recently, stated that if the scale of wages decided on by ship laborers was carried through, they would have to abandon their intention of making Quebec their summer port for all their vessels. The ship laborers are demanding 60 cents an hour for an eight hour day, 90 cents an hour for overtime, and $1.20 for all Sunday work.

Bridgeburg., Ont.—The two vessels remaining to complete the contract for four steamers at the Canadian Allis-Chalmers Co., have been commenced. One has been launched and the second one is ready to launch. One drawback has been the lack of housing accommoda-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tion in the vicinity of the yards. The city council has decided to appeal to the Ontario Housing Committee for aid to local families in order to erect suitable dwellings.

Liverpool, N.S.—The Nova Scotia Shipbuilding & Transportation Co., Ltd., of Liverpool, N.S., had another successful event, when the schooner "Faustina," built for J. F. Creaser Co., Ltd., of La Have, and John Penny of Newfoundland, was launched, J. S. Gardner being the master builder. The dimensions are, net tonnage 150, length over all 117 ft., breadth 26 ft., depth of hold 12 ft. 6 in. The keel of this boat was laid down in January and the construction has been rapidly gone on with owing to the mildness of the winter and no loss of time. The above company are now busy upon two beam trawlers and are laying a keel for a 200-ton, three-mast schooner upon the same spot as where to-day's launching took place.

Montreal, Que.—The Anderson Co., of Beaver Hall Hill, have closed an important contract with the British Government, for the purchase of steam trawlers and wooden drifters from the latter. The contract involves about 150 vessels, and $10,000,000, about 100 of these vessels having been built in Canada. These were built for the Imperial Ministry of Shipping, and were mostly for use as mine sweepers. Since the cessation of hostilities there has been a brisk demand for fishing vessels, and these craft are very suitable for deep sea fishing. The vessels are now lying at Halifax, and will probably be disposed of from that port. Enquiries have been received for these vessels from the French, Dutch and even the British Government, while the Government of the Philippine Islands has bought six.

BOOK REVIEW

Industrial Good-will, by John R. Commons; the McGraw Hill Book Co., New York. Price, $2.00.

In the present period of industrial uncertainty, this volume on the relations existing between capital and labor is a welcome aid in the understanding of many of the movements in the labor world, and in the title, Industrial Goodwill, is found the solution of many of our most pressing problems.

As a commodity labor is subject to the law of supply and demand, which determines wages. The introduction of machinery and later the piece-work method of payment have changed the worker's status in industry, and the present practice of efficiency engineering leads to what the author calls the machinery theory of labor.

The machinery theory, like the commodity theory of labor, is not false, it is incomplete. While the law of supply and demand cannot be overcome it can be modified, and scientific management has its limitations. Successful business is always a scheme of finding that correct proportion of different factors which brings the largest net income of all of them together. An additional factor

which enters into the relations between employer and employee is that of goodwill, and in the achieving of good-will costly labor turnover is minimized. It is this latter phase of industrial relations that the author develops, and through it points out the successful overcoming of many of the problems confronting the employer of labor.

Democracy in industry is dealt with and the co-operation of both parties is advocated. Other phases of the subject dealt with are compensation laws, the elimination of unemployment, and the related problem of finding work for the unemployed. Industrial insurance, the health of the worker, shop government and working conditions are treated at length, and education, technical and national, form an important part of this work.

CANADIAN PATENTS.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, Kent Building, Toronto, from whom further particulars may be obtained. James C. Cockburn animal trap; John Fraser, churn; Thomas D. Kelly, planes for aeronautical machines; Wm. P. Perry, apparatus for distilling; Paul Wilde, plants for warming and moistening the soil surface; John West and Wm. Wild, retorts and methods of working same; Sigmund Willmer, accumulator electrogrids; Toronto Type Foundry Co., Ltd., universal tool grinding machines; Nels A. Anderson, buckling devices; J. Stone & Co., Ltd., valves for fluid pressure systems for operating bulkhead and like doors; Edward P. Leach, concrete mixer.

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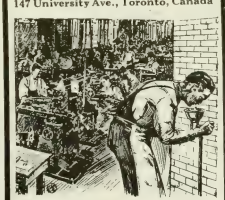

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1—26 x 30" "Canada Machinery Corporation" Back Geared Shaper
1—32" "Smith & Mills" Back Geared Shaper

IRON PLANERS

1—30" x 30" x 10' "Pond" with two Heads on Cross Rail
1—36" x 36" x 12' "Bertram" with two Heads on Cross Rail, also two Side Heads

MILLING MACHINES (New and Used)

1—No. 2 "Cincinnati," Latest Design, Full Universal Miller
1—No. 3½ "Ohio," Latest Design, Full Universal Miller
2—No. 3 "Kempsmith," Latest Design, Full Universal Millers
2—No. 2 "Kempsmith," Latest Design, Full Universal Millers
1—No. 2½ "Le Blond," Latest Design, Full Universal Miller
2—No. 5 "Becker," Latest Design, Full Universal Millers
1—No. 3 "Ford-Smith," Latest Design, Full Universal Millers
3—No. 2 "Ford-Smith," Latest Design, Full Universal Millers
1—No. 21 "Garvin" Plain Miller
1—No. ½ "Rockford" Plain Miller
1—No. 1 "Dow" Plain Miller
1—No. ½ "Van-Norman" Plain Miller
5—No. 2 "Ford-Smith" Plain Millers
1—No. 3 "Ford-Smith" Plain Miller
25—"Becker" No. 7 "Lincoln" Millers with Cabinet Leg and Oil Pumps, at $375.00 each
30—"Pratt & Whitney" No. 14 "Lincoln" Millers, at $375.00 each
2—No. 1B "Becker" Vertical Millers
and many other selections

GRINDERS (Used and New)

2—No. 1 "Sellers" Universal Tool Grinders and Shaping Machines
2—No. 1 "Diamond," 24" x 12" x 9" Automatic Surface Grinders, with Magnetic Chucks
1—No. 70 "Heald" Internal Grinder
1—No. 3 "Wilmarth & Morman" Automatic Surface Grinder, with Magnetic Chuck
1—No. 1 "Landis" Internal Grinder
1—No. 1 "Brown & Sharpe" Universal Grinder
1—No. 3 "Brown & Sharpe" Universal Grinder
2—"La Salle" Automatic Surface Grinders, complete with Magnetic Chucks
1—"Stenotype" Duplex Surface Grinder, with Magnetic Chucks
1—"Abrasive Machine Tool Co." Automatic Surface Grinder
1—"Grand Rapids" Twist Drill Grinder
1—"National" Automatic Surface Grinder, with Magnetic Chuck, capacity 30" x 9"
3—"Le Blond" Universal Cutter and Tool Grinders
2—"Stevens" Universal Cutter and Tool Grinders
1—12" x 36" "Modern" Plain Grinder
and many other selections

LATHES (Used and New)

2—26" x 12' "Bertram" Quick Change, Double Back Geared
8—26" x 12' "Walcott" Quick Change, Double Back Geared
2—26" x 10' "Walcott" Quick Change, Double Back Geared
4 24" x 12' "Whitcomb-Blaisdell" Quick Change, Double Back Geared
1—24" x 12' "Boye & Emmes" Quick Change, Double Back Geared
5 24" x 10' "Canada Machinery Corporation" Quick Change, Double Back Geared
2—18" x 8' "Walcott" Quick Change, Double Back Geared
2 16" x 8' "Canada Machinery Corporation" Quick Change, Double Back Geared
1—16" x 8' "Hendey" Lathe, with Relieving and Taper Attachments
1—16" x 7' "Hendey" Lathe, with Relieving and Taper Attachments
1—16" x 7' "Oliver" Lathe, with Relieving and Taper Attachments
1—18" x 7' "Oliver" Lathe, with Relieving and Taper Attachments
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7—24" "Steinle" Full Swing, 4" spindles
1—No. 6 "Foster" Geared Friction Head

DRILLING MACHINES (Used and New)

5—No. 314 "Baker" High Duty
1—No. 25-24" "Foote-Burt" High Duty
1—24" "Snyder" Heavy Type Upright Back Geared Drill Press
1 26" "Barnes" Upright Drill, Back Geared
1—22" "Barnes" Upright Drill, Back Geared
3—20" "Canada Machinery Corporation" Plain Drills
20—"Henry & Wright," Class "B," High Speed Ball Bearing
1—"Herbert," 14", High Speed Ball Bearing
1—"Sipp" High Speed Ball Bearing
8—"Demeo" High Speed Ball Bearing
4—"Leland-Gifford" Two-spindle Ball Bearing
1—"Leland-Gifford" Three-spindle Ball Bearing
2 "Avey" Four-spindle Ball Bearing
1—"Avey" Six-spindle Ball Bearing
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1—1½" "Acme" Single Head Bolt Cutter
1—1½" "Acme" Triple Head Bolt Cutter
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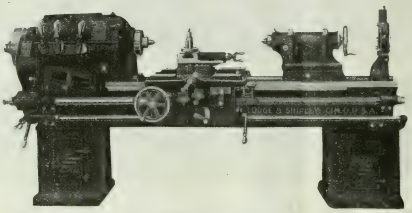

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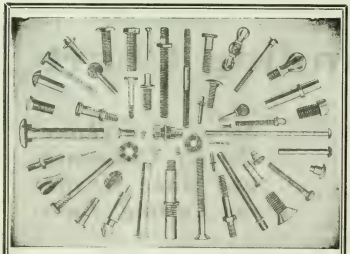

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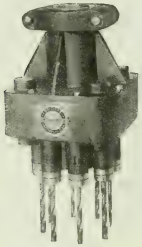

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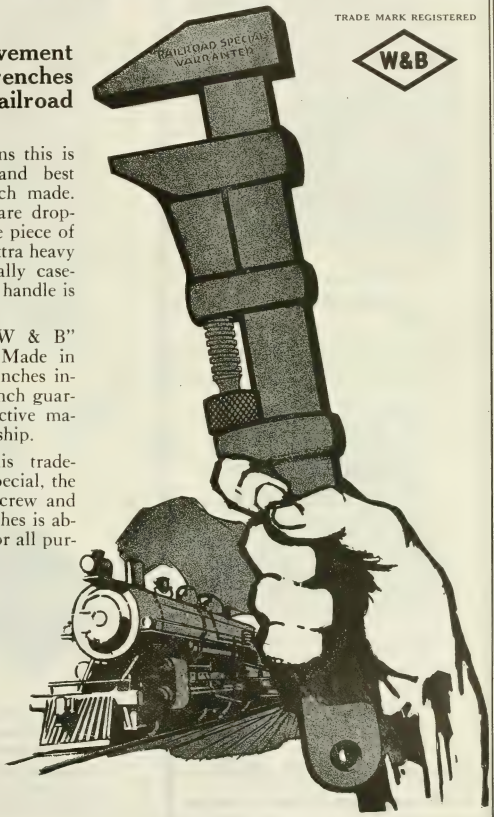

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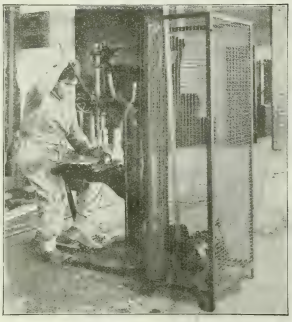

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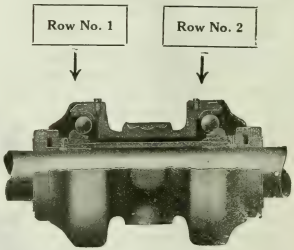

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2—No. 1 American Single Spindle Reversible Shaper with ball-bearing.

1—No. 19½ Holmes Automatic Shaper.

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1—No. 1 Obler 60″ Lathe.

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1—No. 3 Garvin Plain Hand Miller.

2—No. 1 Standard Hand Millers.

2—Globe Universal Tool and Cutter Grinders.

3—No. 2 Eureka Metal Jig Saw.

1—12 x 12 Sullivan Air Compressor with unloader, Class WG3.

1—36 x 42 American Wadsworth Sand Blast Tumbling Barrel.

1—Bake Oven, 6 x 6 x 6, Brantford Oven & Rack's Co's. make.

1—26″ Gardner Disc Grinder.

1—No. 6 Diamond Disc Grinder with 26″ Disc.

1—No. 1 Gray Sheet Metal Cutter.

1—18″ x 10′ bed Hendey Lathe.

1—18″ x 26″ x 12′ South Bend Gap Lathe.

1—No. 2 Van Norman Milling Machine.

2—2-Spindle Allan Drill Presses, Hand Feed.

2—3-Spindle Allan Drill Presses, Hand Feed.

10—Rickert Shafer Tapping Machines.

4—No. 6 Whitney Hand Millers.

4—No. 4 Warner, Swasey Screw Machines, geared friction head with power feed to turret, automatic chuck bar feed.

7—No. 2 Warner, Swasey Screw Machines, geared friction head with power feed to turret, automatic chuck bar feed, plain head.

1—No. 1½ x 9 Acme Screw Machine, power feed to turret.

3—No. 1 Foster Plain Head Screw Machines, with automatic chuck.

4—No. 2 Foster Geared Head Screw Machines, with automatic chuck, bar feed power feed to turret.

4—No. 4 Foster Geared Friction Head Screw Machines with automatic chuck wire feed.

1—½″ Landis Double Head Bolt Cutters.

1—16″ Cincinnati Shaper, NEW.

1—15″ Potter & Johnson Shaper, NEW.

2—No. 730½ Brown-Boggs Geared Press.

Miscellaneous Items

1—60 H.P. Westinghouse Motor, 3-phase, 25-cycle, 550-volt, 720 R.P.M., with bedplate, pulley and starter; NEW.

1—42″ Cameron Combination Model No. 24 Slitting Machine.

1—20 M lbs. Olsen New Universal Wire Testing Machine, hand-operated, arranged to test tensions and compressions up to 8′, with regular equipment.

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Mr. Stefansson's story will be published exclusively in Canada in MACLEAN'S. The series of articles by him, now appearing in American and Canadian newspapers, refer entirely to his experiences on previous explorations and do not deal with the journey that he undertook for the Dominion of Canada and completed last year.

Other Outstanding Features of April MacLean's

"Imperial Relations Must be Worked Out," by Viscount Bryce. An important announcement on the future construction of the British Empire.

"Reconstruction in Turkey," by Stephen Leacock. A humorous article on the present condition of things in Turkey as seen by Canada's great humorist, and applied to Canadian conditions.

"Bulldog Carney," by W. A. Fraser. A splendid novelette of the Canadian West, complete in this issue. Illustrated by Charles L. Wrenn.

"Opening the New Book," by J. K. Munro. An article on the situation at Ottawa created by the new Liberal leadership—smashing, impartial, fearless.

"The Sun Gazer," by Charles G. D. Roberts. A remarkable animal story. Illustrated by Arthur Heming.

"Canada's Fishmonger General," by Thomas M. Fraser. An article on a young Canadian who put Canadian fish on the diet of the British armies by a series of Barnum and Bailey advertising stunts.

"Bombing the Boche," by Lieut. J. Vernon Mackenzie. The second of the two articles that Mr. Mackenzie has written on the whirlwind campaign of raid reprisals which so frightened all Germany.

"The Transformation," by Frederic S. Isham. Illustrated by Hanson Booth. The second instalment of this sparkling new serial.

"Man and Wife," by C. W. Stephens. Illustrated by R. M. Brinkerhoff. The first instalment of a three part story of Canadian life by a new Canadian writer—a delightful love story with a background of business intrigue.

The Review of Reviews

The best articles from all publications the world over are selected and condensed for this department. Some of the articles in the April number are:

The Man Behind Bolshevism.
Could German Fleet Have Been Destroyed?
The Secret Plans of the Allied Command.
Too Much Wilson.
Is the ex-Kaiser Haunted?
Next Government Will be Labor.
New Life of Deposed Princess.
A New Kind of Socialism.
Are We Communicating With Mars?
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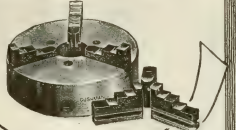

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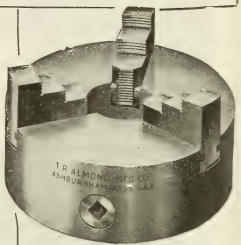

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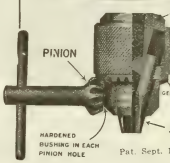

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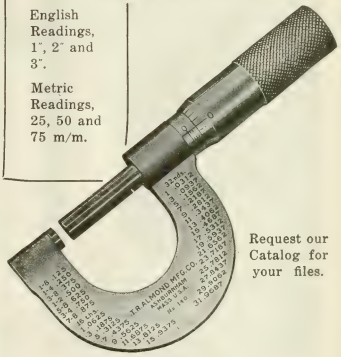

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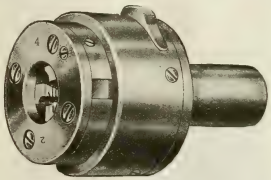

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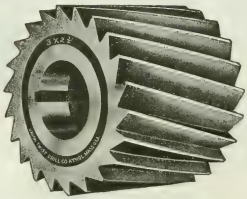

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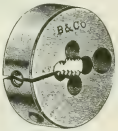

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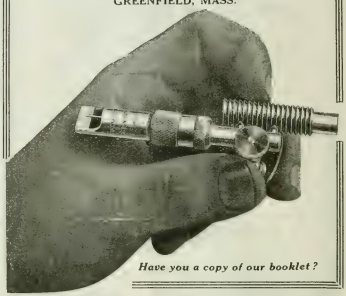

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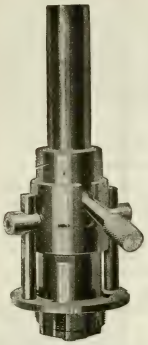

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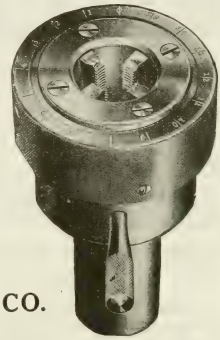

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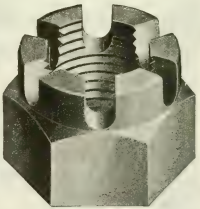

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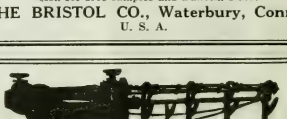

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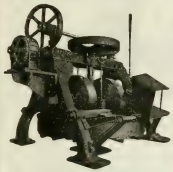

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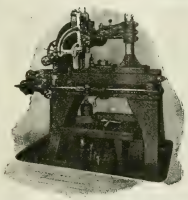

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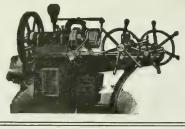

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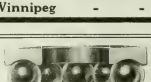

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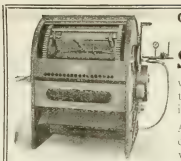

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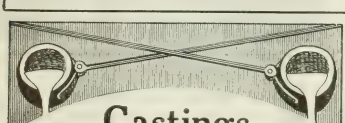

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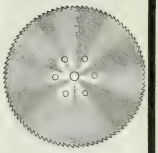

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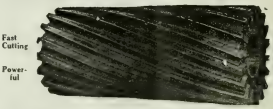

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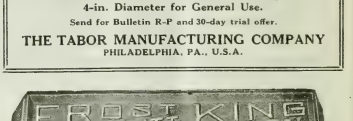

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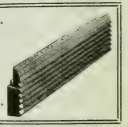

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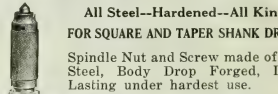

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Do High Prices of Machine Tools Hinder Sales?

THE question asked of a considerable dealer in Toronto by THE FINANCIAL POST is answered by him in THE POST of March 8th, in part, as follows:

> "New lists that are coming out do not show concessions in prices. As long as firms can sell at the present prices there is not much chance for a lower level of values."

The rest of that article in THE POST is interesting, and here are some other extracts worth noting from POST items of this week:

Implement Manufacturers May Unite for Export Trade

"Representatives of the implement manufacturers have been at Ottawa in consultation with the Canadian Trade Commission to arrange for the pushing of their export business. What is likely to be proposed to them is that they should work in concert, and their orders abroad should be placed through a central selling body, the expenses of conducting which should be maintained by a pro rata tax on each member of the association. They will provide their own credits from a common fund, which can be created by contributions gauged according to the respective interests involved."

Steel Market Is Still Unsettled

Big American Interests Co-operating in Secretary Redfield's Plan

The talk of lower prices for steel continues in the market. It is a fact that the "set prices" of the war period have, in many ways, spoiled the trade for what has followed. When prices were fixed, buyers and sellers knew their ground for the coming three months. Not only so, but they were quite certain that when changes would be made they would not be radical, and would be in keeping with the cost of material and labor entering into the output.

Last week a number of prominent steel producers were meeting in New York, and according to the authorized version they "discovered" that George N. Peek, recently named by Secretary Redfield as chairman of "The Industrial Board of the Department of Commerce" was in town, and accordingly they invited him in to explain Secretary Redfield's plan for the deflation of war-time prices. Indications are that the steel producers are going to make a show of resisting the movement, but will eventually yield at the last moment. "The Financial Post," March 8, 1919.

Above is part of a front-page news item in THE POST of March 8th.

Latest Activities of Steel and Iron Using Interests

Stove Manufacturers Out For Export Trade

"The Canadian stove and enamelled ware manufacturers are making an aggressive effort to develop export business and to secure orders from Europe, Australia, New Zealand and South Africa. A. M. Smith, sales manager of the McClary Manufacturing Company, will, on behalf of the manufacturers, make a personal investigation of European prospects."

New Ship Repair Plant For Vancouver

"Seattle men propose to build at Vancouver, B.C., a steel dock of 25,000 tons, capable of handling the largest ships which make the Port of Vancouver. Embraced in the enterprise will be a shipbuilding and repair plant, the whole to cost in the neighborhood of $4,000,000."

New Iron Industries For Border Cities

"Plans are being made for the location of a large malleable iron corporation with extensive connections in the United States, on the Windsor industrial site. Negotiations to this end have been pending for considerable time. Altogether, 12 large manufacturing firms with headquarters across the border are negotiating for sites in the Border Cities."

Business Building News Items Appear Each Week in *The Financial Post*

The above are only a few of the many subjects of real profit-making interest to Canadian men of affairs which have been dealt with by expert writers and editors in THE POST of March 8th. THE POST will keep you informed on Canadian business matters in a way unrivalled by any other publication. Send for a subscription to-day. The price is $3.00 per year, and you have only to fill in this form:

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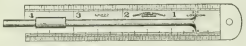

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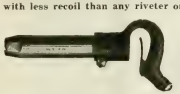

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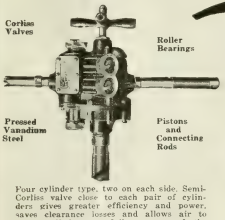

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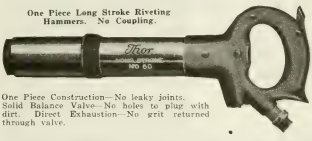

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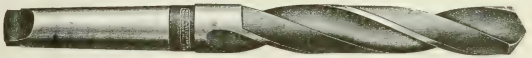

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11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

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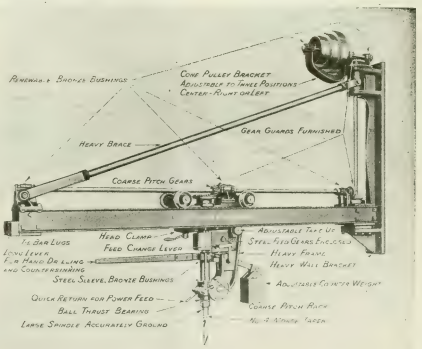

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Sheldons, Ltd., Galt, Ont.

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Ford-Smith Mach Co., Hamilton, Ont.
Wheel Trueing Tool Co., Inc., Sydney, Ont.
Williams & Wilson, Limited, Montreal, Que.

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W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Limited, Montreal, Que.

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Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Henry & Wright Mfg. Co., Hartford, Conn.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES, RADIAL AND TURRETT
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, SENSITIVE
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Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
D. McKinnon Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati, Ohio
Williams & Wilson, Limited, Montreal, Que.

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John Bertram & Sons Co., Dundas.
Garlock-Walker Machinery Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Fry's (London), Ltd., London, England.
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A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
D. McKinnon Machinery Co., Galt.
Reed-Prentice Co., Worcester, Mass.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Keystone Mfg. Co., Buffalo, N. Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Fry's (London), Ltd., London, England.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. Co., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.
United States Mach. Tool Co., Cincinnati, Ohio
Williams & Wilson, Ltd., Montreal, Que.

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Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Will Twist Drill Co. of Canada, Walkerville, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Baker & Co., Newark, N. J.
Cincinnati Electrical Tool Co., Cincinnati, Ohio
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Electrical Tool Co., Cincinnati
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, EMERY
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Albany Hardware Spec. Co., Albany, Wis.

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Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Montreal.
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McKenna Brothers, Pittsburgh, Pa.
Marshall Co., Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill.
Perfect Machine Co., Galt, Ont.
Pirsee, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. Co., Hamilton, Ont.
Taylor, J. A. M., Stair Bldg., Toronto
Whitman & Barnes, St. Catharines, Ont.
Will Twist Drill Co. of Canada, Walkerville, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Morse Twist Drill & Mch. Co., New Bedford, Mass
Rice Lewis & Son, Toronto, Ont.

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Cleveland Pneumatic Tool Co. of Canada, Toronto
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
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Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
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Cincinnati Electrical Tool Co., Cincinnati, Ohio
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Will Twist Drill Co. of Canada, Walkerville, Ont.

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Cleveland Pneumatic Tool Co. of Canada, Toronto
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A. R. Williams Machy. Co., Toronto.

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Twist Drill Co., Lead, Ltd. Newcastle

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Pure Sanitary Drinking Fountain Co., Hardenville, Mass.

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Coventry Chain Co.
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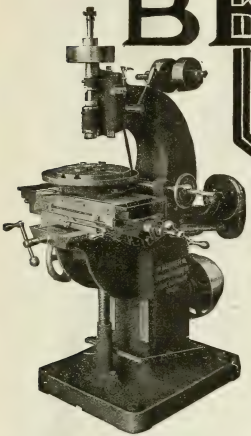

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Swedish Gage Co., New York, N.Y.
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Toronto Tool Works, Toronto, Ont.
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Garlock-Walker Machinery Co., Toronto, Ont.
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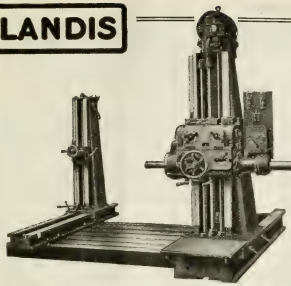

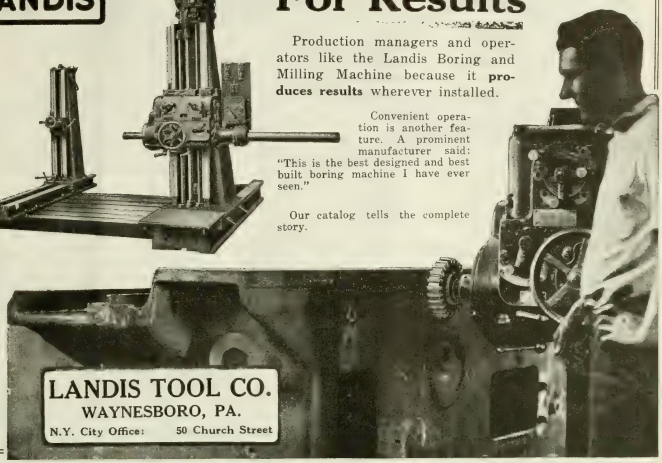

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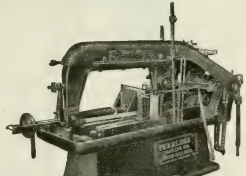

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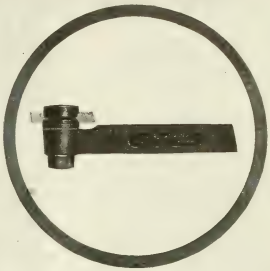

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Pratt & Whitney Co., Dundas, Ont.
Walls Brass & Cap Co., Ltd., Toronto.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal Que
Wood Turret Mach. Co., Brazil, Ind., U.S.A
Williams & Wilson, Limited, Montreal, Que.

LEAD BURNING

St. Lawrence Welding Co., Montreal, Que.

LEATHER STRAPPING

Dodge & Knight Mfg. Co., Worcester, Mass.

LENSES FOR GOGGLES

Standard Optical Co., Geneva, N.Y.

LIDS, SCREW TOP AND HINGE

Can. Westinghouse Co., Ltd., Windsor, Ont.

LIFTS, PNEUMATIC

Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

LINK BELTING

Can. Fairbanks-Morse Co., Montreal
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LINOLEUM MILL MACHINERY

Bertrams, Ltd., Edinburgh, Scotland.

LOADERS, WAGON AND TRUCK

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

LOCKERS, STEEL, WARDROBE AND STEEL MATERIAL

Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ontario.

LUBRICANTS

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Elm Cutting Oil Co., Toronto, Ont.
Ontario Lubricating Co., Hamilton, Ont.

LUBRICATING OIL, FILTERING AND CIRCULATING SYSTEMS

Bowser & Co., S. F., Inc., Fort Wayne, Ind.

LUBRICATORS

Trabern Pump Co., Rockford, Ill.

MACHINE, MOVING WEIGHTS

Keite Foundry, Galt, Ont.

MACHINERY, CORNER AND BENDING

Peck, Stow & Wilcox Co., Southington, Conn.

MILLING ARBORS

Kearney & Trecker Co., Milwaukee, Wis.

MACHINERY DEALERS

Archibald & Co., Chas. P., Montreal, Que.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, HAMMERING AND NAIL

Garlock-Walker Machinery Co., Toronto, Ont.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY MOVERS

Marten Mach. Co., Hamilton, Ont.
Frost Mfg. Co., Chicago, Ill.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

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Clipper Belt Lacer Co., Grand Rapids, Mich.

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Norton Grinding Co., Worcester, Mass.

MACHINE SHOP WORK

James Morrison Brass Mfg. Co., Toronto, Ont.

MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES

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Marten Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
MacGowen & Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
J. H. Williams & Co., Brooklyn, N.Y.
Williams & Wilson, Limited, Montreal, Que.

MACHINE TOOLS

Cincinnati Lathe & Tool Co., Cincinnati, O.
Williams & Wilson, Limited, Montreal, Que.

MACHINE & REPETITION WORK

Keite Foundry, Ltd., Galt, Ont.

MANDRELS, CHUCK

Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES

Pritchard-Andrews Co. of Canada, Ottawa, Ont.
Matthews & Co., John, Pittsburgh, Pa.

MARKING MACHINERY

Brown, Borges Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Perrin, Wm. R., Toronto.
Williams & Wilson, Limited, Montreal, Que.

MEASURING MACHINES

Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING

Bowser & Co., S. F., Inc., Fort Wayne, Ind.

MEASURING TAPES AND RULES

James Chesterman & Co., Ltd., Sheffield, Eng.

METALLURGISTS

Toronto Testing Laboratory, Ltd., Toronto.

METAL SAWS

Simonds Mfg. Co., Fitchburg, Mass.

METALS

Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Drummond, McCall & Co., Toronto, Ont.
International Metal & Trading Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
United States Metal & Lead Co., Toronto.

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METERS

Can. Cartridge Co., Hamilton, Ont.

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MICROMETERS

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Parker, J. & M. 248 State Bldg. Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLS, SAND

Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY

Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Walls Bros., of Can., Galt, Ont.

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Bertram, John, & Sons Co., Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hastings Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt-Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, AUTOMATIC

Hilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.

MILLING CUTTERS

Cleveland Milling Machine Co., Cleveland, O.
Kearney & Trecker Co., Milwaukee, Wis.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, HAND

Brinkie Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hastings Bros., Inc., Chicago, Ill.
United States Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Becker Milling Machine Co., Boston, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram, John, & Sons Co., Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Eddund, Cortland, N.Y.
Hastings Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, PROFILE

Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Fox. The Geo. F., Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
William & Wilson, Limited, Montreal, Que.

MILLING TOOLS

Altenhaid Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Mach. Co., Hamilton, Ont.
Gemeritie Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Taboo Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Limited, Montreal, Que.

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Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sydney Mines, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Manitoba Bridge & Iron Works, Ltd., Winnipeg, Can.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MODEL WORK

Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Mach. Co., New Britain, Conn.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
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Can. Driver-Harris Co., Ltd., Walkerville, Ont.

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Williams & Wilson, Limited, Montreal, Que.

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National Machinery Co., Tiffin, Ohio.
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Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

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Prest-O-Lite Co., Inc., Toronto, Ont.
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Can. Fairbanks-Morse Co., Montreal.
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Fox Machine Co., Jackson, Mich.
Gartock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
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Williams & Wilson, Limited, Montreal, Que.

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Williams & Wilson, Limited, Montreal, Que.

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Hydraulic Machy. Co., Ltd., Montreal, Que.
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Williams & Wilson, Limited, Montreal, Que.

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West Tire Setter Co., Rochester, N.Y.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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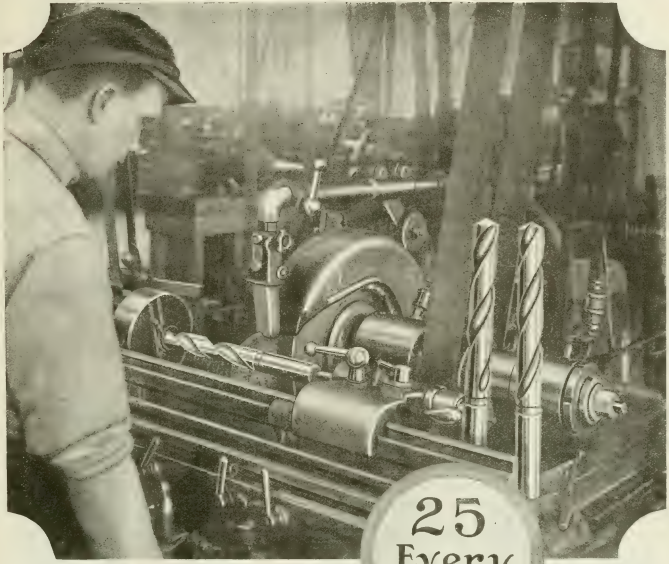
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Ferracute Machine Co., Bridgeton, N.J.



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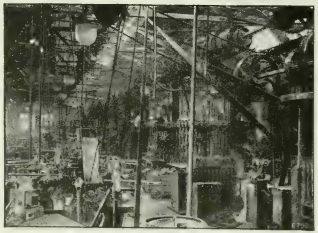

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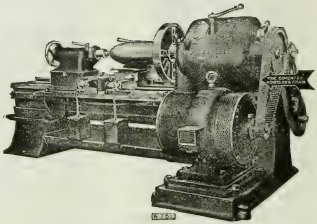

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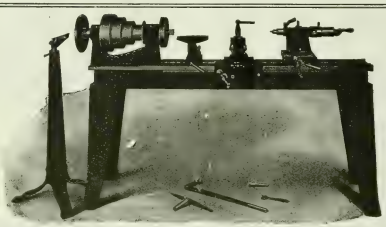

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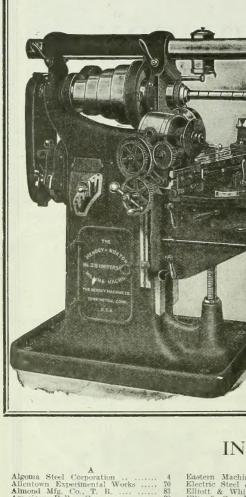

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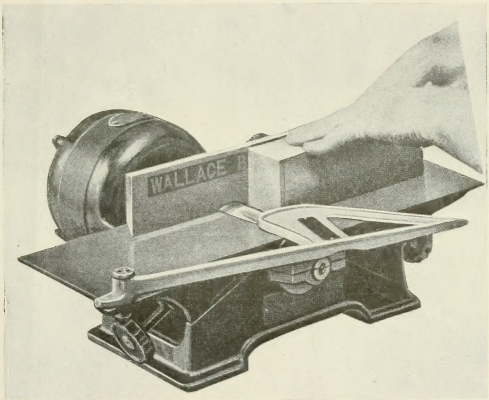

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C.M.C.

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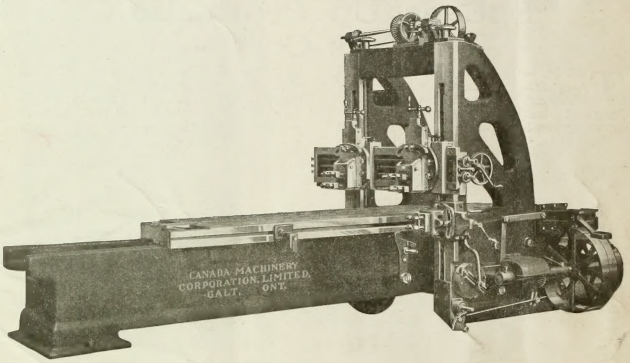

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